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CRAMP'S SHIPYARD 1830—1902

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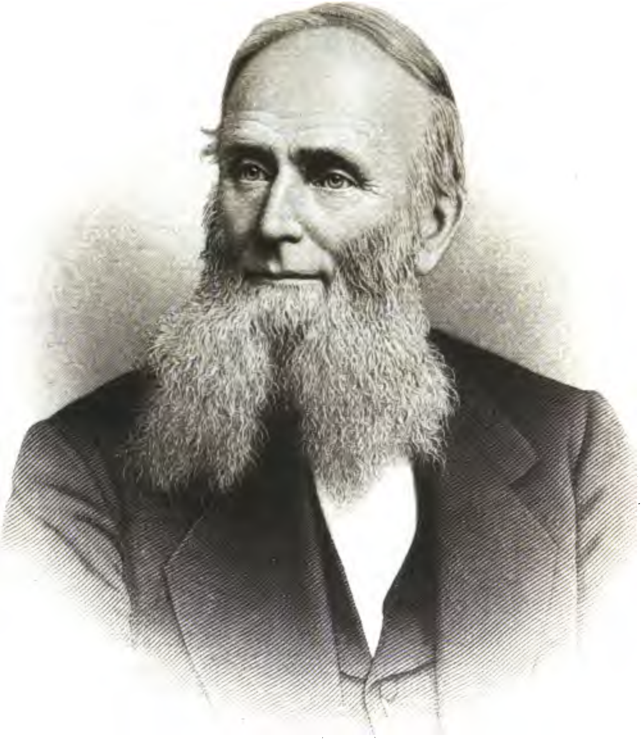

Wm. Cramp

CRAMP'S SHIPYARD

founded by

William Cramp

1830

PHILADELPHIA
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& ENGINE BUILDING COMPANY
1902

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INTRODUCTION

CRAMP'S SHIPYARD [illegible] third year of [illegible]

[illegible]

[illegible]

CHARLES H. CRAMP.

CRAMP'S SHIPYARD enters upon its seventy-third year of existence with the most extensive plant, most universal equipment, and the largest and most thorough organization in its history.

It was founded by William Cramp in the year 1830, when he was twenty-three years old. The first location was at the foot of Otis Street, now called East Susquehanna Avenue. At this place, and subsequently at the foot of Palmer Street, now occupied by the Company's Basin Dry Dock, Marine Railway and Repair Shops, William Cramp built ships forty-two years.

The ship-yard of those days bore but faint resemblance to the ship and engine building establishment of to-day. Then wood was the sole material of construction, and sails the principal agency of propulsion. True, the art of naval architecture was as requisite in ship-building then as now; but the mechanical appurtenances necessary to fashion and shape wooden frames, knees, and planking were few and simple compared to the ponderous machines which prepare the parts of iron and steel hulls, engines, and boilers for their uses.

At that time the capital required to create a ship-building plant was the comparatively small sum needed to construct sheds, build slips, erect saw-mills, and buy or rent water frontage on the Delaware. Now it requires millions of dollars to properly found, organize, and equip a ship and engine-building establishment of the first class.

Some idea of the difference may be derived from the fact that there is a single tool in Cramp's ship-yard of to-day, the cost and value of which is considerably greater than that of William Cramp's entire ship-yard sixty years ago. This tool is the great floating derrick "Atlas," and it cost about $30,000, more than the entire capital William Cramp had invested in his plant of 1841, which was not then surpassed in extent or capacity by any other ship-yard on the Delaware.

However, the Old Palmer Street yard, though small in extent, and limited in equipment as compared with its successor of to-day, turned out many important ships, both sail and steam, for domestic and foreign merchant account, and war-ships for the United States and for South America.

No engine-building plant was attached to the old ship-yard; hence the steamships it built were powered by contract with independent engine builders. This system worked well enough so long as marine machinery was of secondary importance, but the rapid development of steam shipping immediately after the Civil War rendered a combination of the two industries indispensable to the best success.

The area of the old yard being inadequate to growing requirements, about one-third of the water front of the present establishment was purchased in 1871–1872, and The William Cramp & Sons Ship and Engine Building Company as it now exists was incorporated by Act of the Legislature, in March, 1872.

Immediately afterward the site of the old yard was used for a basin dry-dock and marine railway, for which it is well adapted.

From that time to the present the growth of plant and organization has been steady. Notwithstanding periods of comparative depression, and notwithstanding the entire absence of anything that might be termed a boom in commercial ship building, the Cramp Company has been able to maintain an almost uniform advance, has kept fully abreast of current progress and development abroad, and has steadily led it at home.

The record of thirty years—1872 to 1902—shows an increase of capital stock from $500,000 to $5,000,000, and an increase in actual value of ground and equipment from $500,000 to about $10,000,000.

The founder of the establishment, William Cramp, died in 1879, and his eldest son, Charles H. Cramp, was chosen to succeed him as president of the company.

Since that time much of the work of the yard has been directed to the reconstruction of the navy, and its operations in that direction embrace at this writing the construction of seventeen modern war ships, beginning with the double-turreted monitor, TERROR, and including the first class battle-ship MAINE, and the great armored cruisers COLORADO and PENNSYLVANIA, now building.

Most of this work has exceeded in importance any ever attempted in this country, and it has not been excelled anywhere abroad.

The total number of sea-going vessels of all descriptions built either by William Cramp, or by the firm of William Cramp & Sons, or by The William Cramp & Sons Ship and Engine Building Company, since 1830, is 321; and the total number of marine engines built or building up to date is 220, ranging in indicated horse-power from 500 or 600 in the earliest steamships to the gigantic twin-screw engines of 23,000 indicated horse-power required to propel the great armored cruisers PENNSYLVANIA and COLORADO 22 knots per hour.

Of the 321 vessels, 25 have been United States steam men-of-war of various dates from 1861 to the present time; one first class protected cruiser for the navy of Japan;

and 4 old type steam cruisers, 1 first-class modern protected cruiser, and 1 first-class modern battle-ship for the Russian navy; 103 ocean steamers of from 1,000 to 12,500 tons register, together with 26 steamboats not sea-going, 54 tugs, including the SAMSON, which was the first steam-tug built in America: 9 sea-going steam-yachts; 28 first-class sailing vessels or "clippers," and 60 odd other craft for various uses.

The area of the main ship-yard embraces 46 acres, while the area of the dry dock, two marine railways and the repair yard at the foot of Palmer Street, a short distance below, in 6.4 acres, making a total acreage in use of 52.4.

The boundaries of the main ship-yard are: Richmond and Dyott Streets on the west; the property of the Lehigh Valley Railroad Company on the south; Cumberland Street on the north, and the Delaware River on the east.

The principal structures used for shop purposes are as follows:

(1) A building on Beach Street, 1,200 feet long, with an average width of 72 feet, and having a total ground and floor area of 460,000 square feet. In this immense building—one of the largest structures under one roof in the world used for mechanical purposes—are the bending shed, black-board shed, ship-shed, pipe-cutting shop, sheet-iron shop and joiner-shop on the ground floor; two extensive mould lofts and joiner-shop on the second floor, and pattern shop on the third floor of the south one-third of the building, together with machinery and tool store-house using four floors.

(2) A boiler shop, 384 feet long, by 58 feet breadth, with a bay of the same length 50 feet wide; the total area being 62,000 square feet.

(3) A new machine shop extending along Norris Street

from Richmond to Dyott, 333 feet long by 142 feet breadth, having in parts of the structure three floors; the area of the ground floor is 45,000 square feet, of the second floor, 27,000 square feet, and of the third, 13,000 square feet. This building is completely equipped with new tools throughout of the most modern and approved type in every respect, and all the tools in it are driven by electric motors.

(4) The Morris Machine Shop and Foundry, covering the entire block bounded by Beach, Ball, Richmond and York Streets, with an interior court-yard; the entire area of the ground and second floors inclusive being 122,000 square feet.

(5) General blacksmith shop on Cumberland Street, 307 feet long by 100 wide. Floor space 30,700.

These are the most conspicuous structures. There are many others of less importance, whose total area taken together is about one-half that of the principal buildings above described in detail.

The handling of materials in the principal shops is done by cranes, as follows: in the boiler shop, two electric travelling cranes of 50-tons capacity each, and one of 20-tons; in the new machine shop two 50-tons, two 30-tons, and two 10-ton cranes; in the Morris Foundry, two 50-ton and one 5 ton; in the Morris Machine Shops, two 30-ton, and one 20-ton cranes; all of which are driven by electric motors, except two in the Morris machine shops.

The offices and principal draughting-rooms of the establishment are at the corner of Beach and Ball Streets, in a six-story building, having a total ground and floor area of 25,500 feet.

The water front of the main ship-yard is 1,517 feet, and that of the Dry Dock, Marine Railway and Repair Yard is 483 feet, or 2,000 feet altogether.

The total area of wet-docks is about 200,000 square feet, and the total length of wharfage, including wharf ends, is 5,200 feet, or say in round figures, one mile.

There are 12,000 lineal feet of standard-gauge railway track and 1,260 feet of narrow gauge within the boundaries of the ship-yard.

The building slips are eight in number. Four of them have a building length of 480 feet each, two of 500 feet each, and two of 600 each. Six of these eight building-slips are provided with overhead or gantry travelling cranes, one crane serving two slips. One of these gantries has a total length of 541 feet, one 629 feet, and the other 752 feet. Two of the cranes have a spread of 190 feet, with 86 feet hoist; the other one a spread of 176 feet with 73 feet hoist. All these gantries are built throughout of steel, no wood being used in their construction.

In the Dry Dock and Repair Yard, the ship sheds, machine shops, etc., cover an area of 18,000 square feet, with one overhead travelling crane, 760 feet of railway and 787 feet of wharfage; the rest of the acreage being taken up by the Dry Dock and the two Marine Railways.

The Dry Dock is 472 feet long by 70 feet width of entrance, and has a draft of 22 feet on the sill at mean high water.

The Marine Railways are capable of hauling out vessels of 1,000 tons register.

The brass foundry and brass finishing shops belonging to the company are located at the corner of York and Thompson Streets, about 200 yards distant from the main works. They are fully equipped for the manufacture of every variety of brass, bronze, manganese bronze, and white metal castings, and provided with a travelling crane of 25 tons capacity, besides jib cranes. The melting and pouring facilities of the brass foundry are sufficient for single castings of 50,000 pounds weight. The output of the brass foundry, while primarily designed to meet the current requirements of the ship-yard work, is vastly in excess of it, and supplies the industries of the whole country with specialties in manganese bronze and white brass, of which processes the Cramp Company has sole control in the United States and Canada.

The ATLAS floating derrick, previously referred to in a comparison between the old ship-yard and the new, is the largest and most powerful floating derrick in the world.

During the past four or five years, the mechanical methods and operating system at Cramp's Ship-Yard have been completely revolutionized. With few and unimportant exceptions, all riveting is now done by power, either hydraulic in boiler making or pneumatic in the construction of hulls. The ship-yard is provided with a complete system of pneumatic piping underground, and so arranged that the compressed air can be taken off by means of flexible hose and applied to the uses of riveting, drilling, chipping, caulking, blowing rivet-heating fires, etc., inside and outside of ships building on the stocks and also throughout the interiors of ships afloat and alongside the wharves.

The compressed air is supplied by several compressors, two of which, on the compound system, are the largest and most powerful in the world.

The ship-yard, including the slips and all the machine shops, foundries, offices, etc., is lighted throughout with electricity.

The total increase of actual value of the ship-yard by the enlargements and improvements that have been made since 1895 amounts to over $5,000,000, or, in other words, the practical doubling of the actual value of the plant and its accessories in that time. This has been done without any increase of capital stock.

As it now stands there is no other ship-yard in the world so universally equipped with appliances for saving labor and expediting progress of work as Cramp's.

In a word, it may be said that the resources of modern ingenuity in bringing mechanical appliances to the aid of human skill have been exhausted in the equipment of Cramp's ship-yard.

During the seventy-two years of its existence, the number of men currently employed from time to time in Cramp's ship-yard has increased from less than 100, who worked for William Cramp when he began business on his own account in 1830, to the army of 8,000, which is about the maximum employed by the existing company; and the pay-roll has grown from a few hundred dollars a week in the primitive old yard at the foot of Palmer Street to $84,000 a week, which has been paid out for labor quite recently. And it may be said besides, that the amount of labor and wages paid by the contributory industries upon which the ship-yard relies for structural material in various stages of manufacture, has grown in proportion. Naturally such a colossal growth has brought with it a corresponding extent of general and national importance.

The ship-yard has reached a stage of development at which it is not merely a manufactory in private hands, but the greatest naval arsenal in the Western Hemisphere, universally recognized by our own Government, foreign governments, the press, and the people as a public institution of the first importance to sea-power either in the naval or the commercial sense.

Clipper Ship MANITOU.

The founder of these works, William Cramp, was of the true American pioneer type; the type of men who leave behind them permanent monuments of creative genius. Beginning work on his own account at the early age of twenty-three, and on a considerable scale for those times, he steadily pushed his way to the front, shrinking from no obstacle, and not dismayed by any misfortune. He was essentially a man of steady habits; free from vices, scrupulously exact in business engagements; methodical in the conduct of his work; a thorough and effective disciplinarian in the management of his working force; yet mild of manner and genial of intercourse.

His pride in his work, which was extraordinary, sprung more from his ambition to excel in professional reputation than from any sordid motive. He liked a profitable contract; but he liked better to have his name borne over the world as the builder of famous ships; and more than once in a long career his ambition for distinction of that kind got the better of his desire for profit. At the time of his death he had completed more than half a century of constant professional work on his own account, during which period he had doubtless missed fewer days' work than any man he ever employed. His vigor of body was equal to the energy of his mind, and it is literally true that his last illness was also his first.

At an early period of his career the value of the enterprise which he was steadily creating became apparent to his neighbors, and he soon established a business standing and repute universally conceded to be unimpeachable, so that when business misfortunes came to him, as they do to almost every active man one time or another, he was able to overcome them and pursue the even tenor of his way.

The existing establishment may fairly be viewed as a case of "survival of the fittest." When William Cramp laid his first keel in 1830, there were not less than twelve other ship-yards on the river fronts of Philadelphia—the Delaware and the Lower Schuylkill—and they were of capacity and importance approximately equal to his. No trace of any of them lingers now; excepting the establishment of Neafie & Levy, which is on a comparatively small scale, though possessing good repute for high quality of work, modern ship-building in Philadelphia is concentrated in the shops and yards founded by William Cramp.

To trace the vicissitudes under which these old time ship-yards disappeared one by one might form an interesting study, but for the present it suffices to say that Cramp's alone survives to this day, growing apace with the city, the country, and the times in which we live, until it has become a colossal monument to the perseverance, patience, industry, and probity of the modest man whose name it bears.

The ship-yards which have vanished built wooden vessels only. When the great change from wood to iron came, the establishment founded by William Cramp proved to be the only one prepared to meet the new conditions. No one not familiar with the ship-building art can comprehend the full significance of the transition. It involved not only new processes but new skill. Hardly a tool that was useful in wood construction could be turned to use in iron. The wood-working ship-wrights found themselves practically compelled to learn a new trade. But, animated by the pluck and perseverance of William Cramp, those in his employ enthusiastically co-operated with him, and quickly mastered the new art. All saw that the iron ship was inevitable, and William Cramp accepted it at the threshold of its advent. The other ship-builders of his era could not or would not meet the new conditions, and their establishments have passed away.

In surveying this transition and its effects upon the commercial dominion of the sea, it is worth while to note that the period of William Cramp's activity as a builder of wooden vessels, was also the era of the greatest importance of the United States as a commercial power in the ocean-carrying trade, namely, from 1830 to 1861. It is not within our present scope to survey the peculiar causes which led to its sudden and great decline.

Suffice, for the purposes of this sketch, to say, that as soon as the American people had fairly settled down to the pursuits of peace after the great Civil War, and the advent of the iron ship was assured as a controlling factor in maritime supremacy, William Cramp directed toward the re-building of our merchant marine on that basis the same skill, the same energy and the same cheerful faith in the ultimate destinies of the American people on the ocean, that had marked his career under the old régime. Met at the threshold by the powerful and vindictive rivalry of England, exultant with the strides of progress which our unfortunate civil strife had enabled her to make unopposed, and at the same time supported or encouraged by our own people feebly or not at all, William Cramp's first efforts to domesticate iron ship-building on these shores were put forth under conditions that would have appalled most men.

But there is nothing in the history of his career during that period to indicate that from the day he laid the keel of the GEORGE W. CLYDE till the day of his death, his resolution ever wavered or his faith ever faltered. He did not live to see the development of his ambitions, but he laid wisely the foundations upon which his successors have builded so well.

The last ship laid down under William Cramp's management was the CHALMETTE, of the Morgan Line, and her ship-yard number was 207, so that during his half century of professional activity he built 207 vessels. Many of them, as, for example, the BRIDGEWATER, MANITOU, and MORNING LIGHT of the Clipper period, the NEW IRONSIDES and CHATTANOOGA, of the War Navy, and the four American Line ships were the most important vessels of their time under our flag.

It is not easy to overestimate the impress which the builder of 207 ships for commerce or for war makes upon the destinies of his country; no single mind can trace the ramifications of the influence due to his creations; for their keels have ploughed every sea for the commercial aggrandizement of the Republic, and the thunder of their cannon has been heard in battle for its life.

This is an epitome of the public character and services of William Cramp. In private life he was the embodiment of domestic and neighborly virtues. He never wrought an injury and never missed a chance to help. He lived beloved and died mourned by every one who had ever known him.

Edwin S. Camp

M[illegible] AT CRAMP'S SHIPYARD.

[illegible]	NAME.	Length.	[illegible]	[illegible]	Battery. Main.	Battery. Secondary.	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Yo[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible] New [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

MEN-OF-WAR BUILT AT CRAMP'S SHIPYARD.

Ship-Yard No.	NAME.	DIMENSIONS.			Tons Disp. Normal.	Indicated H. P.	Type of Engines.	Speed in knots	BATTERIES.		Contract Price.	PREMIUM.
		Length.	Breadth.	Mean Draught.					Main.	Secondary.		
254	Protected Cruiser BALTIMORE.	335	48½	18½	4413	10,064.418 on 4 hours trial at sea.	Twin Screw, Horizontal Triple-Expansion.	20.1	6 6-inch 4 8-inch Breech Loading Rifles.	4 6-pdr. R. F. 2 3-pdr. R. F. 2 1-pdr. R. F. 4 37 mm. R.C. 2 Gatlings.	$1,325,000.	$106,441.80 for excess of 1,064.418 H.P. over guaranteed 9,000 H.P.
255	Gun-Boat YORKTOWN.	230	36	14	1700	3,398.25 on 4 hours trial at sea.	Twin Screw, Horizontal Triple-Expansion.	17.2	6 6-inch Breech Loading Rifles.	2 6-pdr. R. F. 2 3-pdr. R. F. 1 1-pdr. R. F. 2 37 mm. R.C. 2 Gatlings.	$455,000.	$39,825 for excess of 398.25 H. P. over 3,000 guaranteed H. P.
256	Dynamite Cruiser VESUVIUS.	246¼	26½	9	725	4,366	Twin Screw, Vertical Triple-Expansion.	21.646	3 Pneumatic Dynamite Guns, 15-inch Calibre.	3 3-pdr. Rapid Fire.	$350,000.	Speed requir'd 20 Knots. Speed attain'd 21.646 Knots.
257	Protected Cruiser PHILADELPHIA	335	48½	19$\frac{5}{24}$	4324	10,500 Maximum.	Twin Screw, Horizontal Triple-Expansion.	19.678	12 6-inch Breech Loading Rifles.	4 6-pdr. R. F. 4 3-pdr. R. F. 2 1-pdr. R. F. 3 37 mm. R.C. 4 Gatlings.	$1,350,000.	$135,600 for excess of 0.678 knot ov'r guaranteed speed of 19 knots.
258	Protected Cruiser NEWARK.	320	49⅛	18¾	4083	8,868.577 on 4 hours trial at sea.	Twin Screw, Horizontal Triple-Expansion.	19.5	12 6-inch Breech Loading Rifles.	4 6-pdr. R. F. 4 3-pdr. R. F. 2 1-pdr. R. F. 3 37 mm. R.C. 4 Gatlings.	$1,248,000.	$36,857.70 for excess of 368.577 H. P. over 8,500 H.P. guaranteed.

MEN-OF-WAR BUILT AT CRAMP'S SHIPYARD.

Ship-Yard No.	NAME.	DIMENSIONS.			Tons Disp. Trial Trim.	Indicated H. P.	Type of Engines.	Speed in Knots	BATTERIES.		ARMOR.			Contr. Price.	PREMIUM.
		Length.	Breadth.	Mean Draught.					Main.	Secondary	Belt.	Turret or Barbt.	Deck.		
268	Armored Cruiser NEW YORK.	380½	64	23 7/12	8480	17.401 mean of 4 hours sea trial.	Twin Screw, Triple-Expansion, Vertical. 2 Engines on each Shaft.	21	6 8-in. B. L. R. 12 4-in. B. L. R.	8 6-pdrs. 4 1-pdrs. 4 gatlings.	in. 3¼	in. 10	in. 6	$2,985,000.	$200,000 for 1 knot over 20 knots guaranteed.
269	Protected Cruiser COLUMBIA.	412	58	24	7475	18.509 mean of 4 hours sea trial.	Triple Screw, Triple-Expansion, Vertical.	22.81	1 8-in. B. L. R. 2 6-in. B. L. R. 8 4-in. B. L. R.	2 6-pdrs. 4 1-pdrs.	—	—	4	$2,725,000.	$350,000 for 1.81 knots over 20 knots guaranteed.
273	Protected Cruiser MINNEAPOLIS.	412	58	24	7475	21.800 mean of 4 hours sea trial.	Triple Screw, Triple-Expansion, Vertical.	23.05	1 8-in. B. L. R. 2 6 in. B. L. R. 8 4-in. B. L. R.	2 6-pdrs. 4 1-pdrs.	—	—	4	$2,690,000.	$414,600 at rate of $50,000 per ¼ knot for 2 knots excess over 21 knots guaranteed.

Ship-Yard No.	NAME.	DIMENSIONS.			Nor. Disp.	Indicated H. P.	Type of Engines.	Speed in Knots.	BATTERIES.		ARMOR.			Contract Price.	PREMIUM.
		Length.	Breadth.	Mean Draught.					Main.	Secondary	Belt.	Turret or Barbt.	Deck or Sponson.		
											in.	in.	in.		
270	Battle-Ship INDIANA.	348	69¼	24	10,298	9,000	Twin Screw, Triple-Expansion, Vertical.	15	4 13-in. B.L.R. 8 8-in. B.L.R. 4 6-in. B.L.R.	20 6-pdrs. 6 1-pdrs. 4 Gatlings.	18	17	3	$3,063,333	$25,000 for each ¼ knot over 15
271	Battle-Ship MASSACHUSETTS.	348	69¼	24	10,298	9,000	Twin Screw, Triple-Expansion, Vertical.	15	4 13-in. B.L.R. 8 8-in. B.L.R. 4 6-in. B.L.R.	20 6-pdrs. 6 1-pdrs. 4 Gatlings.	18	17	3	$3,063,333	$25,000 for each ¼ knot over 15
275	Armored Cruiser BROOKLYN.	400	64.8	24	9,150	18,000	Twin Screw, Triple-Expansion, Vertical. 2 Engines on each Shaft.	20	8 8-in. B.L.R. 12 5-in. B.L.R.	8 6-pdrs. 4 1-pdrs. 4 Gatlings.	3	10 & 6	6 & 3	$2,986,000	$50,000 for each ¼ knot over 20
276	Sea-Going Battle-Ship IOWA.	360	72	24	11,300	11,000	Twin Screw, Triple-Expansion, Vertical.	16	4 12-in. B.L.R. 8 8-in. B.L.R. 6 4-in. B.L.R.	22 R. F. and M. G.	14	14 & 8	3 & 2	$3,010,000	$50,000 for each ¼ knot over 16

MEN-OF-WAR BUILT AT CRAMP'S SHIPYARD.

Ship-Yard No.	NAME.	DIMENSIONS.			Tons Disp. Normal.	Indicated H. P.	Type of Engines.	Speed in Knots.	BATTERIES.		ARMOR.			Contract Price.
		Length.	Breadth.	Mean Draught.					Main.	Secondary.	Belt.	Turret or Barbt.	Deck or Sponson.	
	Sea-Going Battle-Ship ALABAMA.	368	72.5	23.6	11,525	11,365	Twin Screw, Triple-Expansion, Vertical.	17	4 13-in. B.L.R. 14 6-in. R.F.	16 6-pdr. R.F. 4 1-pdr. R.F. 1 Gatling. 1 Field Gun.	16½	17 to 15	4 & 3	$2,650,000.
302	Sea-Going Battle-Ship MAINE.	388	72.2	23.6	12,300	16,000	Twin Screw, Triple, Vertical Water-tube Boilers.	18	4 12-in. B.L.R. 16 6-in. R.F.	6 3-in. R.F. 8 6-pdrs. 6 1-pdrs. 2 Colts' 2 3-in. R.F. Field Guns.	11	12 to 11	4 to 3	$2,885,000.
316	First-Class Armored Cruiser COLORADO.	502	69.6	24.1	13,680	23,000	Twin Screw, Vertical, Triple-Exp., Water-tube Boilers.	22	4 8-in. B.L.R. 14 6-in. R.F.	18 3-in. R.F. 12 3-pdrs. 8 1-pdr. 2 3-in. R.F.B.I. 6 Colts'. 2 Machine E.	6 to 5	6½ to 6	....	$3,780,000.
317	First-Class Armored Cruiser P'NNSYLVANIA	502	69.6	24.1	13,680	23,000	Twin Screw, Vertical, Triple-Exp., Water-tube Boilers.	22	4 8-in. B.L.R. 14 6-in. R.F.	18 3-in. R.F. 12 3-pdrs. 8 1-pdrs. 2 2-in. R.F.B.I. 6 Colts' 2 Machine E.	6 to 5	6½ to 6	....	$3,780,000.
315	TURKISH CRUISER.	330	42	16	3,300	12,000	Twin Screw, Vertical, Triple-Exp., Water-tube Boilers.	22	2 6-in. R.F.G. 8 4.7-in. R.F.G.	6 3-pdrs. 6 1-pdrs.	....	....	4 inch slopes. 1½-inch flats.	....

MEN-OF-WAR BUILT AT CRAMP'S SHIPYARD FOR THE IMPERIAL RUSSIAN NAVY.

Ship-Yard No.	NAME.	DIMENSIONS.			Tons disp. Normal.	Indicated H. P.	Type of Engines.	Speed in knots	BATTERIES.		ARMOR.			Contract Price.
		Length.	Breadth.	Mean Draught.					Main.	Secondary.	Belt Turret Deck or Barbt Sponson.			
300	First-class Battle ship RETVIZAN.	384	72.2	24.7	12,750	18.255	Twin Screw, Triple-Expansion, Vertical.	18	4 12-inch 40 Cal. B.L.R. 12 6-inch 45 Cal. R.F.	20 75 mm. 50 Cal. R.F. 20 47 mm. R.F. 6 37 mm. R.F. 2 2½-inch Field Guns.	9	9		
	First class Protected Cruiser VARIAG.	420	52	19.6	6,500	17,059	Twin Screw, Triple-Expansion, Vertical.	23¼	12 6-inch 45 Cal. R.F.	12 75 mm. 50 Cal. R.F. 6 3-pdr. Hotchkiss.				

FOR THE IMPERIAL JAPANESE NAVY.

Ship-Yard No.	NAME.	Length.	Breadth.	Mean Draught.	Tons disp. Normal.	Indicated H. P.	Type of Engines.	Speed in knots	Main.	Secondary.	Belt Turret Deck or Barbt Sponson.			Contract Price.
	First-class Protected Cruiser KASAGI.	374,6	48.9	17.9	4,900	15,297	Twin Screw, Triple-Expansion, Vertical.	22¾	2 8-in. R.F. 10 4.7 R.F.	12 12-pdr. R.F. 6 2½-pdr. Hotchkiss.				

EARLIER MEN-OF-WAR BUILT AT CRAMP'S SHIPYARD.

	Name.	Date.	Tons Disp.	Engines.	I. H. Power.	Speed in Knots	Battery.	Remarks.
	U. S. S. NEW IRONSIDES.	1862	5,080	Simple Back-acting.	1,800	11	16 11-in. S. B. 2 200-pdr. Parrotts	Broadside Ship, Wood. Iron-Clad.
	U. S. S. WYALUSING.	1863	970	Simple Back-acting.	400	9	6 9-in S. B. 1 60-pdr. Parrott.	Double-Ender Gun-Boat.
	U. S. S. YAZOO.	1863	2,150	Simple Grass-hopper.	750		2 15-in. S. B.	Monitor, Iron.
	U. S. S. CHATTANOOGA.	1865	3,300	Simple Back-acting.				Cruiser, Wood.
	U. S. S. TERROR.	1874	4,000	Compound Inclined.	1,800	10	4 10-in. B.L.R. 8 R. F. Guns.	Twin Screw, Double Turreted Monitor.
Russian Cruisers.	ASIA.	1879	2,490	Altered from Merchant Ships.				
	AFRICA.	1879	2,852					
	EUROPE.	1879	3,170					
	ZABIACA.	1880	1,230	Designed as a Man-of-War.				

LIBERATADOR, Venezuelan Gun-boat, 355 tons. 1859.
FOUR U. S. TRANSPORTS during the Civil War, and Two U. S. LIGHTHOUSE TENDERS.

PRINCIPAL YACHTS BUILT AT CRAMP'S SHIPYARD.

ATALANTA, for Mr. Jay Gould.
CORSAIR (renamed "Kanapaha") for Mr. C. J. Osborn.
STRANGER, for Mr. George Osgood.
THESPIA, for Mr. David Dows, Jr.

PEERLESS, for Mr. Charles W. Harkness.
First Triple Expansion Engine in America.
COLUMBIA, for Mr. J. H. Ladew.
DOROTHEA, for Mr. Thomas McKean.

THE MORE IMPORTANT COMMERCIAL VESSELS BUILT AT CRAMP'S SHIPYARD.

CLIPPER SHIPS.

Bridgewater	**1,557** Tons.	**John Trucks**	**900** Tons.
Manitou	**1,400** "	**Chamberlain**	**910** "
Morning Light	**850** "	**Isaac Jeanes**	**810** "

OCEAN STEAMSHIPS.

AMERICAN LINE.

St. Louis	**10,700** Tons.	**Ohio**	**3,392** Tons.
St. Paul	**10,700** "	**Pennsylvania**	**3,126** "
Kroonland	**12,500** "	**Indiana**	**3,126** "
Finland	**12,508** "	**Illinois**	**3,126** "

MORGAN LINE.

El Sol	**4,523** Tons.	**El Paso**	**3,531** Tons.
El Mar	**3,531** "	**Chalmette**	**3,531** "
El Monte	**3,531** "	**Eureka**	**2,983** "
El Dorado	**3,531** "		

RED "D" LINE.

Venezuela	**2,842** Tons.	**Valencia**	**1,598** Tons.
Caracas	**2,584** "	**Yaquina Bay**	**1,589** "
Philadelphia	**2,499** "	**Curacoa**	**1,508** "

CLYDE LINE.

Cherokee	**2,557** Tons.	**Comanche**	**3,202** Tons.
Seminole	**2,557** "	**Apache**	**3,378** "
Iroquois	**2,944** "	**Arapahoe**	**3,378** "
Algonquin	**2,833** "		

NEW YORK AND CUBA MAIL—WARD LINE.

Morro Castle	**6,000** Tons.	**Esperanza**	**5,000** Tons.
Havana	**5,667** "	**Monterey**	**5,000** "
Mexico	**5,667** "		

OCEAN STEAMSHIP COMPANY—SPRECKELS' LINE.

Mariposa	**3,158 Tons.**	**Sonoma**	**6,253 Tons.**
Alameda	**3,158 “**	**Ventura**	**6,253 “**
Sierra	**5,989 “**		

BOSTON FRUIT COMPANY.

Admiral Dewey	**2,104 Tons.**	**Admiral Schley**	**2,104 Tons.**
Admiral Sampson	**2,104 “**	**Admiral Farragut**	**2,104 “**

OREGON RAILWAY AND NAVIGATION COMPANY.

Queen of the Pacific	**2,728 Tons.**	**State of California**	**2,266 Tons.**
City of Puebla	**2,590 “**		

CENTRAL PACIFIC RAILWAY COMPANY.

Tacoma	**3,119 Tons.**	**San Pedro**	**3,119 Tons.**
San Pablo	**3,119 “**		

METROPOLITAN LINE.

H. F. Dimock	**2,626 Tons.**	**H. M. Whithey**	**2,707 Tons.**
Herman Winter	**2,626 “**		

NEW YORK AND SAN DOMINGO LINE.

George W. Clyde (first Compound Engine in America)	**1,805 Tons.**

MERCHANTS' AND MINERS' LINE.

Essex	**2,531 Tons.**	**Allegheny**	**2,014 Tons.**
Berkshire	**2,014 “**		

CLIPPER SHIP MORNING LIGHT

THE CHELTENHAM PRESS N.Y.

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Clipper Ship MORNING LIGHT.

CLIPPER SHIP MORNING LIGHT

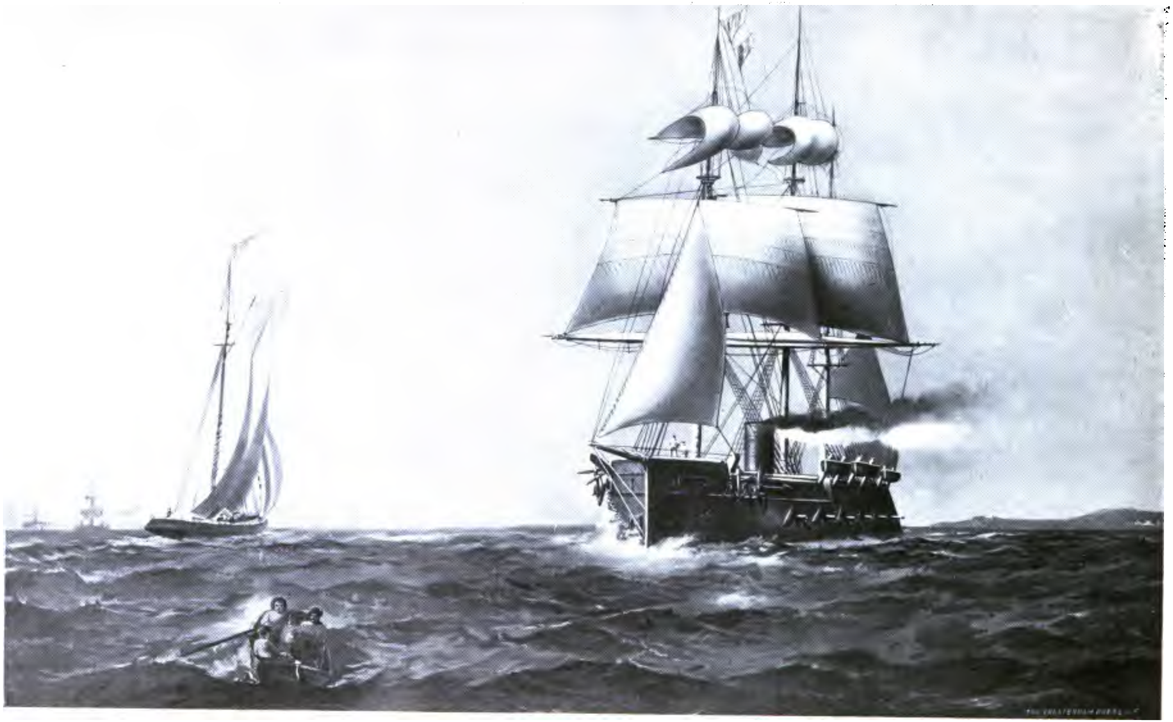
THE immediate precursor of the modern "Ocean Greyhound," was the Clipper Ship of the forties and fifties. In the infancy of steam navigation, the stately clippers, with their splendid hulls, great spars and enormous spreads of canvas often outstripped the steamers. One of the most celebrated and successful clippers of her day was the MORNING LIGHT, built by William Cramp, in 1853, for the account of Buckner & McCammon, merchants, of Philadelphia.

The "poetry of the sea" became idyllic in these winged ships, which rode the waves more like living creatures than like mechanical structures. The MORNING LIGHT has been preserved by the cunning hand of the artist, that the generations who see only transatlantic liners in commerce, and huge floating castles bristling with turrets and casemates, and clad with thick steel for war, may know in what kind of ships the forefathers went down to the sea.

The MORNING LIGHT was one of the smaller of the clipper ships built by William Cramp during that period, but none of the others has been preserved by art. The BRIDGEWATER was nearly twice the tonnage of the MORNING LIGHT, as was also the MANITOU. They were all of the same type, however, and the ship-building records of that time agree that the full-rigged clipper ships of the Delaware represented the perfection of naval architecture, and for many years spread the fame of American ship-yards to every quarter of the globe. Larger sailing ships have since been built both in wood and in iron, but so far as model, sea worthiness, and symmetry are concerned, they have not been improved upon.

The supremacy of Philadelphia in the ship-building art was established before the beginning of this century, and the sailing record between Cape Henlopen and Liverpool is still held by a Philadelphia ship, the REBECCA SIMS, built in 1800, of which further mention will be made. Thus the competitors whom William Cramp had to meet at the outset of his career were masters of the art, and to hold way with them he had to build ships rating with the best in the world. The MORNING LIGHT was principally employed in the California trade around Cape Horn, in which she made a number of remarkably successful voyages. Though, as already remarked, much smaller than other Cramp-built clippers, she was considered one of the best sea-boats, and fastest and most weatherly sailors of her time.

U. S. S. NEW IRONSIDES



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The New IRONSIDES.

U. S. S. NEW IRONSIDES

AT the outbreak of the Civil War armored ship construction was in its infancy. Except a few iron-clad floating batteries employed at the bombardment of Kinburn in the Crimean War, and the armored frigates WARRIOR of the English Navy, and COURONNE of the French Navy, just then completed, there was no guide of experience or observation as to either design or structure of iron-clad vessels. Our Government, however, at an early period determined to build the most powerful cruising iron-clad that the facilities of the country would admit. William Cramp & Sons unhesitatingly entered this untried and unknown field, and made a contract for the construction of the NEW IRONSIDES. She was of entirely unique design, 250 feet long over all, 58 feet 6 inches beam, and when fully equipped for sea drew about 16 feet, with a load displacement of about 5,000 tons, her registered tonnage being 3,250 tons. She was ship-rigged, had engines of 1,800 horse-power, and her speed under both sail and steam with a fair wind was about 11 knots. Her battery was sixteen 11-inch Dahlgren guns in broadside, with two 200-pounder Parrott rifles on pivots forward and aft, all protected by sloping or inclined armor 4 inches thick. When the contract was signed, most of the timber of which she was built stood in the forests. But her heavy hull was framed, planked, decked and plated in seven months from the signing of the contract, and in eleven months from that date she was in action against Fort Sumter. Her service continued active and efficient throughout the war, including several actions with Fort Sumter, the bombardments of Fort Fisher, and other important engagements. She was a strong, comfortable, and seaworthy ship, and was generally considered the most formidable sea-going iron-clad of her day. During this arduous period of her service, her Executive Officer was the present Admiral George E. Belknap, one of the ablest and most distinguished officers in the American Navy, who held that position until promoted to command the Monitor CANONICUS.

Though the development of forty years has made the IRONSIDES appear crude, yet in her time, and in view of the circumstances of her building, she was a remarkable achievement, and proved invulnerable to any of the ordnance of that day. Her framing was the most massive ever put in a wooden ship, and her floors withstood without serious injury the explosion of a large barrel-torpedo under her while at anchor off Charleston. In several actions when her monitor consorts were severely handled and two sunk, her sloping sides, protected by 4-inch iron plating laid upon 14 inches of solid timber backing, constantly deflected the enemy's shot, and the only injury she received, in more than twenty battles, was that of having a port shutter carried away.

The most conspicuous service of the NEW IRONSIDES was in the bombardment of Fort Fisher, January 13 and 15, 1865, and it was also her last heavy engagement. She had been continuously at sea for over two years at that date, and all the time in Southern waters, but being coppered she escaped the fouling to which iron-bottomed ships are subject, and her cruising and manœuvring efficiency was never greater than at

Fort Fisher. Her station there was on the left of the "inner line," composed, besides herself, of the double-turreted Monitor MONADNOCK, and the single-turreted Monitors SAUGUS, CANONICUS, and MAHOPAC. The IRONSIDES anchored about 600 yards from the middle bastion of the Fort, in which were mounted two 150-pounder Armstrong rifles. As these guns were much more powerful than any of the ordnance which the IRONSIDES had encountered at Charleston or Savannah, it was feared that she would suffer. But she withstood the 150-pounder Armstrongs as well as she had the 10-inch Columbiads and 7-inch Brooke rifles of the Charleston and Savannah defences, and held her station to the end without serious injury; finally dismounting one of the Armstrongs and silencing the other with her battery of 11-inch smooth-bores. It is worthy of note that the combat between the IRONSIDES and Fort Fisher was at the closest range ever attempted by a cruising ship against a land fortification.

No ship of the War-time Navy saw more active service, and none was in action as many times as the IRONSIDES. In 1866, while lying in ordinary at League Island, she took fire and burned to the water's edge, when she sank; having made an imperishable place in our history as the pioneer sea-going armored battle-ship of the American Navy.

THE OLD AMERICAN LINE

THE OLD AMERICAN LINE

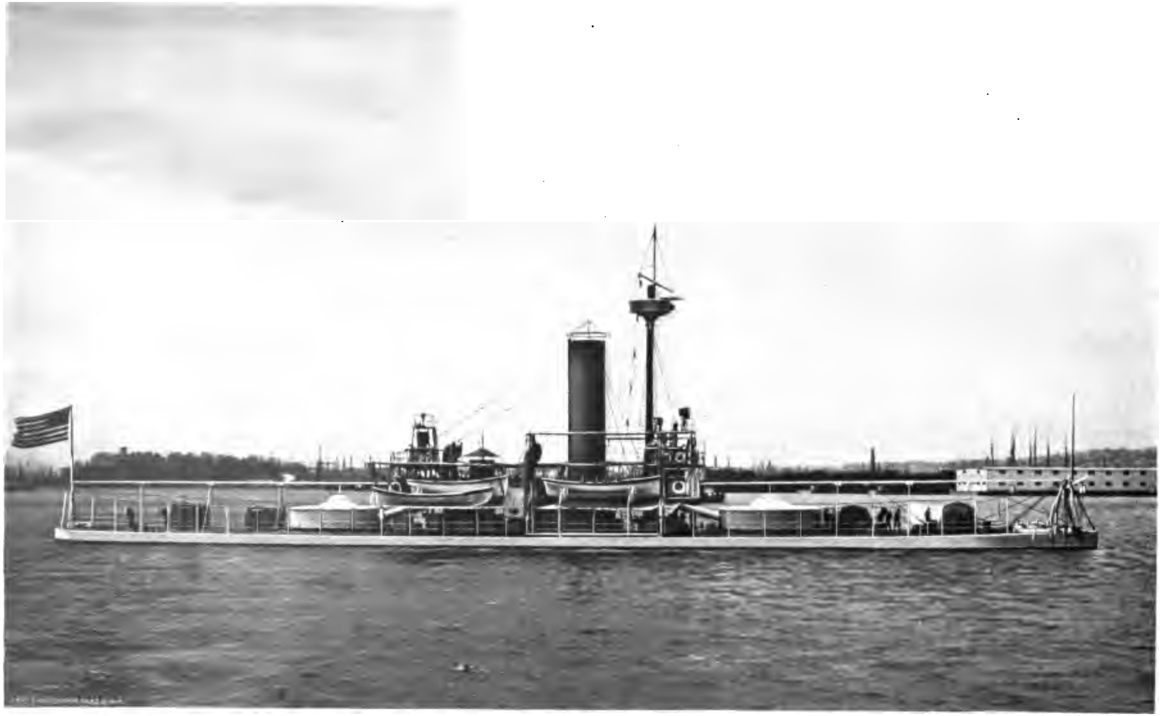
IN 1870 there was a considerable revival of National spirit in an effort to regain the position of a maritime commercial power which our country had lost through the Civil War. The immediate upshot of this movement was the formation of the American Steamship Company, and the construction, by the Cramp Company, of four steamships, known as the INDIANA, ILLINOIS, PENNSYLVANIA, and OHIO. There were at that time indications that the policy of the general Government toward the national merchant marine would be liberal, and it is probable that these indications had some bearing upon the action of the American Steamship Company; but, if so, the policy was altered too soon to realize any benefit, and its subsequent career presented the aspect of an unequal and of course unsuccessful contest between an unaided American private enterprise and British competitors backed by all the resources of their powerful Government.

The four ships of the Old American Line were commissioned in 1872–73. They are 375 feet long over all and 343 feet between perpendiculars; 43 feet beam, with a tonnage depth of 24 feet, United States measurement, and their gross register is 3,126 tons. They were powered with two-cylinder compound engines, having piston diameters of 48 and 90 inches, with 48-inch stroke, and, carrying 65 pounds steam pressure, they developed about 2,000 horse-power, which gave them an average speed of 14 knots. They made eight-day trips, and for a time attracted their share of the trans-Atlantic traffic; but, as already intimated, they succumbed at length to the competition of their subsidized British rivals, and ultimately passed under the control of the International Navigation Company, by whom they have been considered worth re-equipment with new triple-expansion engines after twenty years of continuous service. These ships, though not so large or so high powered as some contemporary vessels, embodied the best ship-building practice of their date as to material and workmanship, and are still creditable specimens of American ship-building skill thirty years ago, as well as of first-rate efficiency in their class.

Suffice to say that, for more than two decades, they have had the melancholy distinction of being the only merchant steamships to show the Stars and Stripes regularly in the ports of Western Europe, and in the 400 and odd passages that each of them has made, their performance has invariably been excellent. At any rate, though over-shadowed in size and distanced in speed by later products of the fierce competition which has followed their advent, the four "American ships" have served to tide the name of the American merchant marine over a score of dreary and disheartening years; and now, in the dawn of a brighter epoch, they remain sturdy links, connecting the promise of the future with the glories of the past. It has been no easy errand to keep the American flag fluttering on a North Atlantic Steamship since 1872; but these four ships have done it, and we feel that, in the present reawakening of our national maritime spirit, the great public will at least pardon the pride we naturally take in them as part of the work of our establishment.

During the Spanish War all four of these ships were taken over by the Government for the transport service.

U. S. S. TERROR



The TERROR.

U. S. S. TERROR

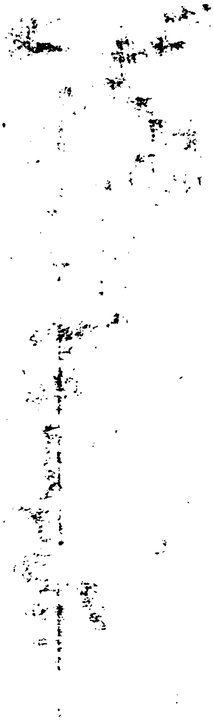
THE iron, double-turreted, low-freeboard, harbor defence ship TERROR belongs to a class which may be said to form a connecting link between the old Navy and the new. Her keel was laid at Cramp's Ship-Yard in 1874, under the then existing authority of the Navy Department, to cause ships to be "repaired" to any extent at discretion. In this case it was undertaken to build a new iron vessel to take the place and the name of a wooden one of approximately similar class then on the Navy List. Subsequently, work on her was suspended, and she remained on the stocks, nearly ready to launch, from 1877 to 1884, when Congress made provision for launching her. In 1885, 1886, and 1887, provisions were made for completion of her hull and machinery, and in the latter year she was delivered to the Government and taken to the New York Navy Yard for installation of her armor and armament. Delays in delivery of armor prevented her completion up to 1896; but finally the armor was finished and installed, and she took her place on the active list in the month of April, 1896. This delay has not been disadvantageous to the public interest, as it has resulted in her being clad with armor and armed with guns vastly superior to those in vogue at the date of her building. She is 259 feet, 6 inches long; 55 feet, 10 inches beam; and, at 14 feet, 6 inches mean draught displaces 4,000 tons, with 28 inches of freeboard amidships.

Her propelling machinery consists of two compound inclined two-cylinder engines of about 1,800 collective indicated horse-power, actuating twin screws, and giving her, in smooth water, a speed of 12 knots.

Her armament is a main battery of four 10-inch B. L. R., mounted in pairs in two turrets on the middle line, and 8 rapid fire and machine guns.

She is armored with an all-round water-line belt 7½ inches thick on a deep wood backing, and her turret walls are 11½ inches in thickness.

Upon the outbreak of the Spanish War, the TERROR was commissioned under the command of Captain Nicoll Ludlow. She was assigned to the North Atlantic Fleet and employed in the blockade of the Cuban coast and Porto Rico. She participated in several bombardments of fortifications on shore, but was not engaged in any naval action.



U. S. S. YORKTOWN

THE CHELTENHAM PRESS, N.Y.

S. YORKTOWN

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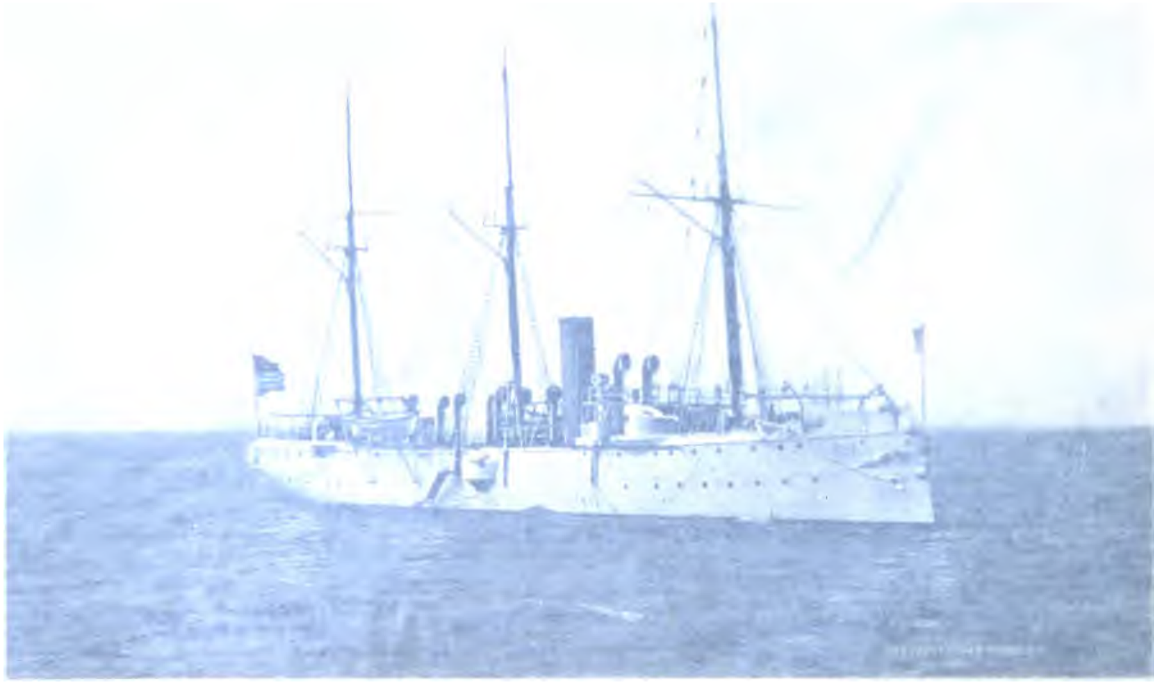


Cruiser YORKTOWN.

U. S. S. YORKTOWN

THE YORKTOWN was launched from Cramp's Shipyard, April 28, 1888, and commissioned at the League Island Navy Yard, March 25, 1889. Her principal dimensions are: length between perpendiculars, 226 feet; depth of hold, 18 feet, 9 inches; greatest beam, 36 feet; draught of water forward, 13 feet, and aft, 15 feet, with a displacement of 1,700 tons.

There are two triple-expansion engines placed in separate water-tight compartments. The air, circulating, and bilge pumps are driven independently of the main engines. There are four cylindrical horizontal boilers. The screws are three-bladed, 10½ feet in diameter. The coal-supply at normal draught is 200 tons, but the bunker capacity is 400 tons. With the latter supply the ship has an endurance of about 3,000 knots at full speed, natural draught, and of about 5,000 knots at 10 knots speed.

On the official four-hour trial, February 14, 1889, the YORKTOWN averaged 16.2 knots, with a mean horsepower of 3,398.25, an excess of 398.25 over the 3,000 guaranteed, the premium earned thereby, at the rate of $100 per unit of excess, being $39,825. On the measured-mile trials at Newport, the average speed for four runs was 16.7 knots; her maximum in one run, 17 knots, and the average horse-power, 3,660. There is a complete steel water-tight deck, reaching from stem to stern. Above and below this deck the vessel is divided into many water-tight compartments. Two sets of dynamos supply electric lights for all parts of the ship. There are two searchlights, each of 25,000 candle-power. The rig is that of a three-masted schooner, spreading about 6,300 square feet of canvas. The main battery is composed of six 6-inch breech-loading rifles, two on the forecastle and two on the poop, with one on each side in the waist. All are mounted on central pivot carriages with 2-inch armored shields.

Two 3-pounder Hotchkiss guns are mounted in bow ports under the forecastle; two 6-pounders and two Gatlings on the rail between the poop and forecastle; two 37 millimetre revolving cannons in stern ports in the cabin under the poop. There are six torpedo-launching tubes; one in the bow, one in the stern, and two on each side of the ship. The complement of the ship is 15 officers, 160 enlisted men, and 18 marines.

The YORKTOWN cruised under Commander Chadwick with the Squadron of Evolution, Acting Rear Admiral Walker, to Europe and through the Mediterranean, until 1891, when Commander Robley D. Evans succeeded to her command. He took her to the Pacific, where she served during the summer of 1892 as flag-ship of the Behring Sea Squadron, protecting the fur-seal fisheries there. It was a curious coincidence, that the flag-ship of the Russian Squadron on similar duty at the same time was also one of Cramp's ships, the ZABIACA. She then came round into the North Atlantic with Admiral Bancroft Gherardi's Special Squadron, to participate in the Columbian Review. While at anchor in Valparaiso Bay, on her way to the North Pacific, some of her sailors were attacked on shore by the Chilean mob, when Commander Evans notified the authorities that, upon a repetition of the outrage, the YORKTOWN would open on the Chilean Cruiser Esmeralda, much her superior in size and armament.

She has been almost continuously in commission since the Cramp Company turned her over to the Government; doing a maximum of service on a minimum of cost for overhaul and repair.

The YORKTOWN was on the Pacific Station during the war with Spain, and saw no war service of particular note.

U. S. S. VESUVIUS

U. S. S. VESUVIUS

DEVELOPMENT of the pneumatic system of throwing shells charged with high explosives, induced the Navy Department in 1886 to experiment with it afloat. Pursuant to this policy, Congress provided in the Act approved August 3, 1886, for the construction of a "pneumatic dynamite cruiser," and prescribed certain requirements as to power, speed, and size.

The contract for this vessel and guns was let to the Pneumatic Gun Company, which company sublet the construction of the hull and machinery to the Cramp Company, who guaranteed to build a vessel to develop a speed of 20 knots; the speed actually attained was 21.646 knots on official trial, and since that has made 22¼ knots over a measured mile. The vessel is fitted with three dynamite guns, 55 feet long, extending up through the deck forward. These guns are neither elevated nor trained relatively to the vessel. The required range is attained by regulating the quantity of compressed air, which is admitted in rear of the projectile, the amounts of air for various ranges being determined by experiment.

These guns are 15 inches calibre, and can fire charges of dynamite weighing as much as 500 pounds with accuracy and safety. The vessel also carries a secondary battery of three 3-pounder rapid fire guns.

The VESUVIUS was launched April 28, 1888, eight minutes after the YORKTOWN. She was commissioned

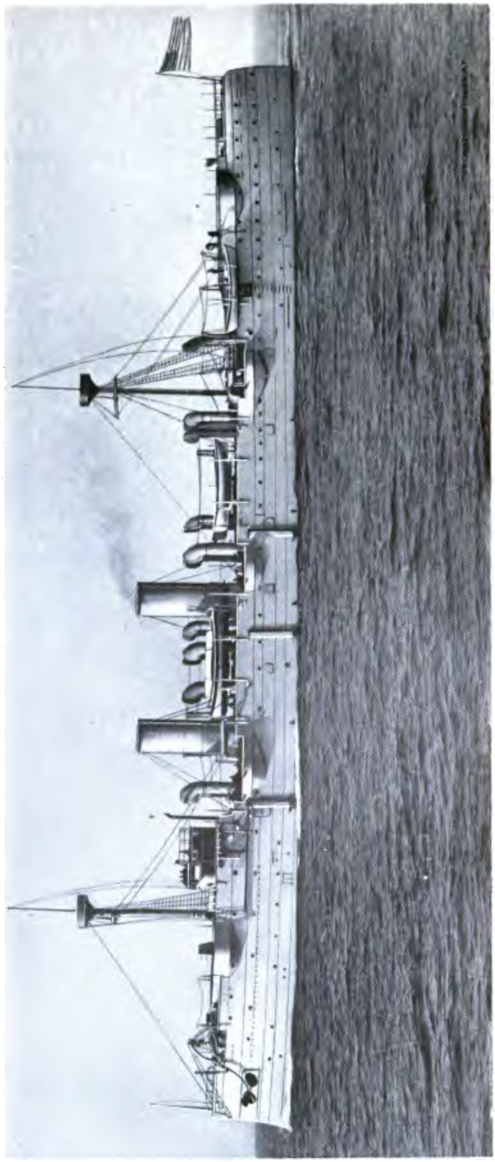
June 3, 1890, at the League Island Navy Yard. Her principal dimensions are: length, 246 feet, 3 inches; 26 feet, 6 inches, beam; depth, 14 feet, and 9 feet draught, with a displacement of 725 tons. Deep loaded, her displacement is 810 tons. There are two vertical triple-expansion engines, with cylinders 21½, 31, and 34 inches diameters, and stroke of pistons of 22 inches; revolutions, 285. Four boilers, 9 feet diameter, and 19 feet, 11¾ inches long; 160 pounds pressure. Two propellers, 7 feet, 9 inches diameter, 9 feet, 4½ inches pitch.

Since her commission the VESUVIUS has been attached to the North Atlantic Squadron, and has participated in the usual cruises of that force along the coast. In January, 1893, she proceeded to Port Royal, S. C., for practice with loaded projectiles from her pneumatic guns. During her voyage from New York to Port Royal, she encountered extremely heavy weather off Hatteras, in which she had abundant opportunity to prove her sea-boat qualities. She weathered the blizzard with no injury more serious than the loss of a boat or two and some shaking-up of her deckhouse.

Her complement is six officers and sixty-four enlisted men, as a dynamite vessel, but if converted into a torpedo cruiser her ship's company will be somewhat modified.

Notwithstanding the success of the VESUVIUS as a sea-boat, and favorable reports on her gun trials, the pneumatic system as applied in her did not prove popular with the leading influences of the navy, and Congress has provided for her conversion into a torpedo cruiser. Among the reports which induced Congress to take this action, was one from a Board of Bureau Chiefs, stating that, without her dynamite gear, the VESUVIUS, as a vessel alone, was worth more than her contract price. The conversion into a torpedo cruiser would divest the VESUVIUS of 147 tons of fixed weights. As torpedo-launching gear of the ordinary type would fall within 20 tons weight, about 127 tons would be added to her capacity for coal and stores, besides affording more commodious and comfortable quarters for her officers and men than is possible with her present armament.

U. S. S. BALTIMORE



Cruiser BALTIMORE.

U. S. S. BALTIMORE

THE Act of August 3, 1886, authorized the construction of a protected cruiser of about 4,500 tons displacement. The Secretary of the Navy, Hon. William C. Whitney, in order to avail the department of the latest and most approved experience abroad, purchased plans and specifications of hull and machinery, which had been prepared by Mr. W. H. White, now Director of Naval Construction to the British Admiralty. Upon these plans and specifications the Cramp Company undertook the construction of a vessel by contract, dated December 17, 1886, which was launched October 10, 1888, and named the BALTIMORE. Her official trial trip occurred in May, 1889, and she sailed from the shipyard in commission under command of Captain Winfield Scott Schley, January 13, 1890. In her design the Government demanded a vessel superior to old-world standards, and heavy penalties were to be exacted in case of failure to realize all that was demanded. She can best be compared with the CHICAGO, which equalled any foreign vessel of her date. Of about the same displacement, and with only a few less of the smaller guns, the BALTIMORE has a heavy protective deck, extending from end to end, absolutely protecting her machinery, magazines, shell-rooms and steering gear, and about five knots greater speed. The complement of the ship is 22 officers, 275 seamen, and 40 marines.

The battery consists of four 8-inch breech-loading guns, mounted in light open barbettes on the poop and forecastle; six 6-inch guns in broadside sponsons, and a large number of machine and rapid-firing guns. The 8-inch guns fire 250-pound shells with a charge of 125 pounds of powder, and have a range of about eight miles. The horse-power required was about 9,000. On the official trial this was exceeded by 1,064.418, which made the total horse-power 10,064.418, which was developed on 900 tons weight of machinery, including the water in the boilers and condensers, and earned for the builders a bonus of $106,441.80. The engines are of the horizontal triple expansion type, the diameters of the cylinders being 42, 60, and 94 inches respectively, with a stroke of 42 inches. The coal-supply at normal draught is 400 tons, but the bunker capacity is 1,168 tons. With the latter supply the ship has an endurance of about 4,500 knots at full speed natural draught, and of about 10,000 knots at 10-knot speed. The BALTIMORE easily kept pace over a long distance, while under natural draught, with one of the latest crack French cruisers, LE TAGE, under forced draught. She is generally considered a 20-knot ship. The vessel was selected as the one to carry the body of the late John Ericsson to his native land. From Sweden she cruised in the Mediterranean, where she attracted great attention, and was universally admired for her graceful appearance, efficient design, and excellent workmanship. From the Mediterranean she proceeded to Chile. Her service in Chilean waters came near involving the United States in serious difficulty with that South American Republic. On one occasion, her commander, Captain Schley, was led to expect attack from the Chilean Squadron in Valparaiso Bay, and he made dispositions to resist by attacking the Chilean iron-clad ALMIRANTE COCHRANE, close aboard. When the imbroglio was over, the BALTIMORE cruised for some time in the Pacific, and then came to the Atlantic, to take part in the Columbian Review. Upon the conclusion of the Columbian ceremonies, she was overhauled, needing but trifling repairs after three years of hard work.

In all respects the BALTIMORE has proved to be the ideal cruiser of what might be termed the mediate class. Though not pretending to rival such special types as the COLUMBIA and MINNEAPOLIS in speed, or the NEW YORK in fighting power, the BALTIMORE is strongly protected, heavily armed and possesses speed and endurance far above the average of her class.

The ceaseless activity in all parts of the world which has marked her career of four and a half years in commission, is conclusive evidence of her usefulness, and the testimony of her officers as to her efficiency, economy, seaworthiness, and comfort is unanimous. Structurally, she embodies the perfection of ship-building art; combining strength, symmetry, and simplicity of hull and power and economy of machinery to a degree unequalled in any other ship of her date.

When war was declared against Spain, the BALTIMORE was in the Asiatic Squadron under Commodore, now Admiral Dewey. In the memorable action of Manila Bay, under the command of Captain Dyer, she bore a conspicuous and decisive part, her heavy battery being served with vigor and effect not second to that of the flagship herself.

After the conclusion of peace the BALTIMORE remained on the Asiatic Station nearly two years.

U. S. S. PHILADELPHIA

THE CHELTENHAM PRESS N.Y.

U. S. S. PHILADELPHIA

[illegible] the [illegible] authorized [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Conference Committee [illegible] the House [illegible] [illegible] the [illegible] to [illegible] in the New [illegible] [illegible] and the PHILADELPHIA.

[illegible] were prepared by [illegible] Navy Department, the [illegible] being similar to that of the [illegible] [illegible] [illegible] [illegible] [illegible] the Cramp company [illegible] [illegible] [illegible] BALTIMORE [illegible] modifications [illegible] to be [illegible] with [illegible] company's design. The contract was awarded [illegible] November [illegible] the price [illegible]

It is worthy of [illegible] the system of special premiums [illegible] was [illegible] for [illegible] of the [illegible] contracts

Cruiser PHILADELPHIA.

U. S. S. PHILADELPHIA

BY the Act approved March 3, 1887, Congress authorized the construction of two protected cruisers of about 4,000 tons displacement; to develop on trial a speed of 19 knots an hour, and to cost, exclusive of armament, not more than $1,500,000 each. This was the outcome of a bill introduced in the Senate in January previous by Senator Cameron, of Pennsylvania, and subsequently proposed as a Senate amendment to the House Bill, providing for the construction of ten such cruisers. The Senate, upon consideration of the House Bill, had reduced Senator Cameron's ten cruisers to four, and the Conference Committee between the House and Senate again reduced the four to two, which are now known in the Navy as the SAN FRANCISCO and the PHILADELPHIA.

Plans were prepared by the Navy Department, the hulls being similar to that of the NEWARK, but heavier and more powerful engines were to be carried. When bids were opened, the Cramp Company submitted a special bid for a vessel having the hull of the BALTIMORE, with modifications to suit the different battery to be carried, and with engines of the Company's design. The contract was awarded on this bid November 29, 1887, the price being $1,350,000.

It is worthy of note that the system of speed premiums was inaugurated in the contracts for construction of the 19-knot cruisers, the basis of premiums in the contracts for previous ships having been the unit of indicated horsepower. This system, so far as the Atlantic coast is concerned, has the serious drawback that in consequence of the shoalness of water at any point near enough to land to admit of fixed ranges for observation, the ships must be run at a formidable disadvantage.

The Act of 1887 contained a proviso that one of the cruisers might be built on the Pacific coast if a reasonable bid should be received from that quarter; and upon this authority, the President awarded the contract for construction of the SAN FRANCISCO to the Union Iron Works, of that city, for $1,428,000, and on the Department's design. The SAN FRANCISCO is 320 tons smaller than the PHILADELPHIA, and her cost was $78,000 greater under this award; a discrepancy which the President considered reasonable in view of the public desirability of promoting the development of ship-building on that coast.

The PHILADELPHIA was launched September 7, 1889. Her trial trip was had in June, 1890, off the coast of Long Island. She sailed from the Shipyard August 5, 1890. The vessel for more than four hours developed a speed six hundred and seventy-eight thousandths of a knot in excess of what was guaranteed, earning bonus for her builders, $135,600.00. Of this amount $35,600 was withheld by the Government, in consequence of a ruling by the Navy Department that only complete quarter knots could be recognized as a basis of premium. She has horizontal twin-screw, triple-expansion engines with cylinders of 38, 58, and 86 inches diameters, with stroke of pistons of 40 inches. She has four boilers, each of 14 feet diameter and 20 feet length. Pressure, 160 lbs. Propellers of 14 feet, 6 inches diameter, 21½ feet maximum, 18½ feet minimum, and 20 feet mean pitch. Revolutions, 125.

The battery consists of twelve 6-inch breech-loading rifles, four 6-pounder rapid firing, four 3-pounder rapid firing, two 1-pounder rapid firing guns, three 37 millimeter revolving cannon and 4 Gatlings. She has proven a most efficient cruiser, and is, in every way, a most successful ship.

On completion of her trials, the PHILADELPHIA was commissioned, under command of Captain Frederick Rogers, and hoisted the flag of Rear Admiral Bancroft Gherardi, as Flagship of the North Atlantic Squadron. In that capacity she cruised principally on our own coasts and in the West Indies. She took part in the Columbian Review, carrying the flag of Rear Admiral Gherardi, the Commander-in-Chief.

Upon the conclusion of those ceremonies, the PHILADELPHIA was ordered to the Pacific Station as Flagship, and proceeded at once from New York, via the Straits of Magellan, to Honolulu. The noteworthy event of this voyage was the longest run on one coaling ever made by an American man-of-war without sail-power and under steam alone. In this respect the machinery of the PHILADELPHIA holds the record for cruising economy and coal endurance over all other ships of her class and date.

U. S. S. NEWARK

U. S. S. NEWARK

THE NEWARK is entirely American in design and fittings. Her [illegible] was [illegible] in the Navy Department, Washington, and her engines were [illegible] built by the [illegible] Company. This vessel, [illegible] Cruiser No. 1, was authorized [illegible] of Congress [illegible] of the [illegible] received were [illegible]. A [illegible] increased the amount [illegible] the [illegible] contracted to build her [illegible] 00[illegible] in the latter part of [illegible] was [illegible] 19, 1890, and was commissioned [illegible] January 2, 1891; and at the same [illegible] her battery and other fittings were placed on board. On April [illegible], 1891, she steamed away, going down the Delaware to League Island.

She is a protected steel cruiser, classed first-rate, with ram bow, bilge keels, and three-bladed twin screws. She [illegible] designed to have a displacement of 4,083 tons, and [illegible] power of 8,500; and on official trial trip exceeded [illegible] by about [illegible] horse-power, which gained [illegible] a premium of $[illegible]. The speed on [illegible] trial was stated to be about nineteen and a half knots. She is an [illegible]. Her transverse frames are [illegible] feet between centres, and she is divided into [illegible] compartments by transverse and longitudinal [illegible], all of which add to the strength of her [illegible], boilers, dynamos, Cruiser NEWARK.

U. S. S. NEWARK

THE NEWARK is entirely American in design and fittings. Her hull was planned in the Navy Department, Washington; and her engines were designed and built by the Cramp Company. This vessel, known as Cruiser No. 1, was authorized by Act of Congress, approved March 3, 1885, but none of the bids received were within the limit of appropriation. A year later, Congress increased the amount available, and the Cramp Company contracted to build her for $1,248,000, and commenced her in the latter part of 1887. She was launched March 19, 1890, and was commissioned at Cramp's Shipyard, February 2, 1891; and at the same yard her battery and other fittings were placed on board. On April 17, 1891, she steamed away, going down the Delaware to League Island.

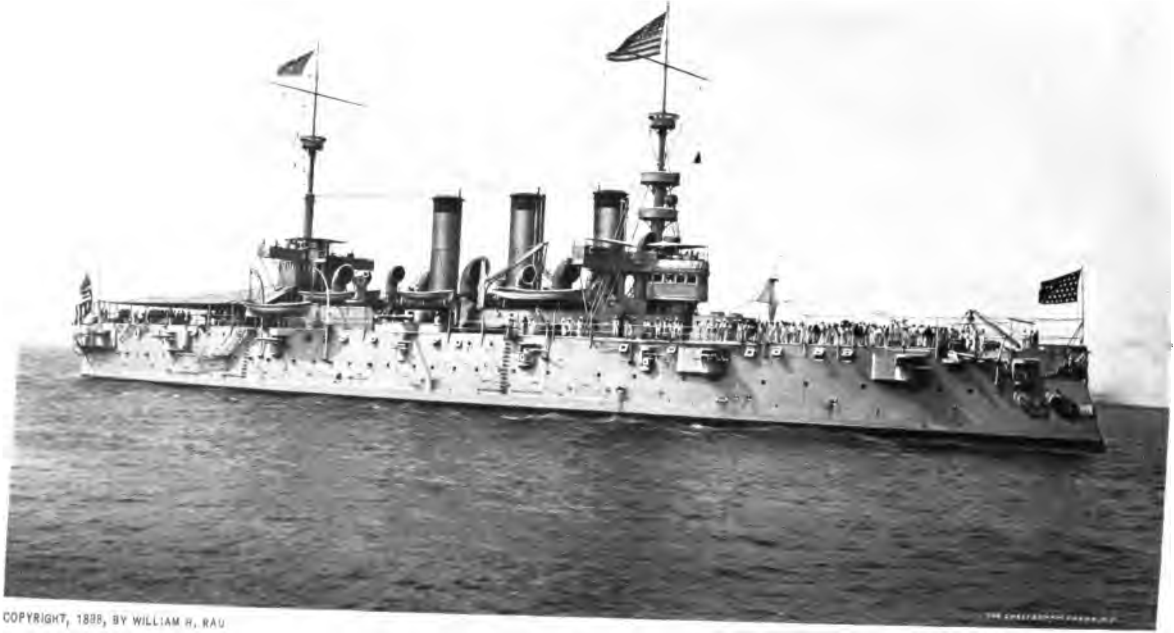
She is a protected steel cruiser, classed first-rate, with ram bow, bilge keels, and three-bladed twin screws. She was designed to have a displacement of 4,083 tons, and horse-power of 8,500; and on official trial trip exceeded the latter by about 368.577 horse-power, which gained the builders a premium of $36,857.70. The speed on the official trial was stated to be about nineteen and a half knots. She is an exceptionally strong ship. Her transverse frames are but three feet between centres, and she is divided into numerous water-tight compartments by transverse and longitudinal bulkheads, all of which add to the strength of her hull. Her engines, boilers, dynamos, steering engines, magazines, shell-rooms, etc., are all below a curved protective deck, extending from end to end. Her length is 328 feet; breadth of beam, 49 feet; extreme draught, about 21½ feet. Her maximum coal capacity is 810 tons, and her daily consumption, at a speed of fifteen knots, is about 70 tons. At a speed of eight knots, she can steam about 10,500 knots in 55 days.

The NEWARK has unusually good quarters for her crew, and excellent quarters for her officers. The complement of the ship is 24 officers, 279 enlisted men and 36 marines. Her main battery consists of twelve 6-inch breech-loading, rifled steel guns, on central pivot carriages. The secondary battery comprises four 6-pounder rapid fire, four 3-pounder rapid fire, two 1-pounder rapid fire, two 37 millimetre Hotchkiss revolving cannon and four Gatlings. She is fitted with six ports for discharging automobile torpedoes; and in her armory she carries 217 magazine rifles, 185 revolvers, and 64 cutlasses. Although a high-powered steamer, she is provided with sail-power, being bark rigged, and designed to spread about 12,000 square feet of canvas.

She was the first of the Navy ships to be completely fitted out and actively commissioned from Cramp's Shipyard, and this policy has been pursued with all the subsequent ships. Her first service was with the Squadron of Evolution. She then went to the South Atlantic Station and thence to the Mediterranean, where she represented the United States for eighteen months. She then sailed from Genoa to Palos, Spain, to act as convoy for the Columbus Caravels in their voyage across the Atlantic. Completing this duty, she appeared in the Columbian Naval Review, and at its close towed the Santa Maria to the St. Lawrence River, on the way to Chicago.

It is worthy of remark that the NEWARK was the last protected cruiser of the new Navy to be provided with sail-power. At the date of her design (1885-1886), the conservatism of the older naval officers in that respect was still strong, and the presence of a bark rig on the NEWARK was the expression of a compromise between them and the new school. To people accustomed to associate spars and sails as a necessary element of the ideal ship, this rig gave the NEWARK an air of grace and majesty wanting in her low-browed, unadorned, and somewhat forbidding consorts. But the reports of officers who have commanded her do not indicate any utility on the part of her sail-power commensurate with its weight, cost, and trouble of taking care of it. Moreover, as resistance to the air at the maximum speed of the ship is generally considered by naval officers equal to at least half a knot, it may be considered settled that sail-power will not again be applied to any high-speed cruiser in our Navy. In fact the rig of the NEWARK has recently been reduced to the modern system of military masts.

U. S. S. NEW YORK



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U. S. S. NEW Y[illegible]

W[illegible] second [illegible] recognition. [illegible] to the [illegible] and [illegible] the [illegible]

[illegible] cruiser [illegible] of our [illegible]

The Act [illegible] construction of the NEW YORK was approved [illegible] 7, 1888, and provided [illegible] armored vessel [illegible] tons displacement, to [illegible] highest [illegible] by that class of ships, [illegible] exclusive of [illegible] not more than $[illegible] construction of the [illegible] in a change of [illegible] Secretary [illegible] this ship for his [illegible] the P[illegible] tons dis[illegible] red [illegible] was co[illegible] ship so [illegible] contract for her [illegible] 28, 1890, or [illegible] years [illegible] of her [illegible] was [illegible] to the Cramp [illegible] at the bene[illegible] two [illegible] abreast to [illegible] themselves were

The Armored Cruiser NEW YORK.

U. S. S. NEW YORK

WE now arrive at what may be termed the second epoch of naval reconstruction. Prior to the NEW YORK, 4,500 tons displacement and 10,000 indicated horse-power had been the maximum of our aspirations in cruising ships. The (old) MAINE and TEXAS, authorized earlier, were somewhat larger than that, but one of them was designed as a battle-ship pure and simple, while the other was a sort of compromise between a second-class battle-ship and an armored cruiser; so that their existence does not impair the force of our remarks as to the NEW YORK.

The Act authorizing the construction of the NEW YORK was approved September 7, 1888, and provided for an armored vessel of about 7,500 tons displacement, to have the highest speed attainable by that class of ships, and to cost, exclusive of armament, not more than $3,500,000. The election of that year resulting in a change of administration, Secretary Whitney left this ship for his successor to deal with. Plans for a ship of 8,150 tons displacement were prepared. Much deliberation was observed in designing this ship, so that the contract for her construction was not signed until August 28, 1890, or within ten days of two years from the approval of her authorizing act. The contract was awarded to the Cramp Company on the Department's plans, except that the boiler arrangement was modified from two sets three abreast to three sets two abreast, and the boilers themselves were slightly enlarged. The contract price was $2,985,000, the speed requirement 20 knots per hour for four consecutive hours, and the premium $50,000 for each quarter knot in excess of the guaranty.

The NEW YORK is 380 feet, 6½ inches long, 64 feet, 10 inches extreme beam, and, at her normal displacement, draws 23 feet, 3½ inches of water. Her power consists of four vertical, triple-expansion engines, working in pairs on two shafts, with disconnecting gear for ordinary cruising. Her main battery is six 8-inch B. L. rifles on the upper deck, four of which are mounted in pairs in two turrets forward and aft on the middle line and two in barbettes on the broadside amidships, and twelve 4-inch rapid fire guns mounted in sponsons on the gun-deck; her secondary battery being eight 6-pounder and four 1-pounder rapid fire guns and four Gatlings in her fighting tops. She has no sail-power, but is equipped with two military masts, each of which carries two fighting-tops, and a crow's nest surmounted by signal-poles.

Her armor is a water-line belt of 4-inch nickel steel extending for about half the length of the vessel amidships, and 8 feet, 6 inches wide. Her protective deck is 3 inches thick on the flat and 6 inches on the slope, the top layer of the slope being of 3-inch nickel-steel plates. Her gun-protection is 10-inch barbettes, surmounted by 5½-inch revolving turrets for the 8-inch guns, and 4-inch sponsons for the 4-inch rapid-fire guns, all of nickel steel.

The design of the NEW YORK was a considerable departure from the policy hitherto pursued with the new Navy. Her predecessors had been either fast protected cruisers like the BALTIMORE, or comparatively slow armored ships like the MAINE. The NEW YORK presents in essential features a combination of the two, but excelling both. While her armor has been lightened considerably as compared with the MAINE, her speed has been increased about five knots, but she still retains effective protection to her vital parts and strong cover for her main battery. Her accommodations for both officers and enlisted men and her general equipment are among the most elaborate and complete ever designed, and there is no vessel of her class and rate in any foreign navy to compare with her in efficiency and economy.

The structural details of principal interest in the NEW YORK are as follows:—

Length between perpendiculars	380 feet, 6½ inches.
Length on L. W. L.	380 feet, 6½ inches.
Length over all (including rudder)	384 feet.
Beam extreme	64 feet, 10 inches.
Beam at L. W. L.	64 feet, 10 inches.
Draught, main, sea-going trim	24 feet.
Displacement, sea-going trim (load draught)	8,529.

The ship is divided into 184 water-tight compartments, and there is a double bottom 3 feet 6 inches in depth amidships, divided into eleven water-tight compartments, and extending from frame 27 to frame 81, and about 29 feet outboard at the midship section. There is also a coffer dam on each side outboard, 3 feet 6 inches wide, between the protective and berth decks, extending the entire length of the ship. Aft of the machinery spaces the coffer dams extend up only about half way to the berth-deck. The coffer dams are filled with cellulose. There are fore-and-aft passages on each side, one two feet wide next the coffer dams, and one four feet wide below the protective deck underneath the coffer dams, and both extending the entire length of the machinery spaces. Both passages are divided up by water-tight bulkheads, and together with the coffer dams form practically an extension of the double bottom, as the bottoms of the lower passages are the tops of the outboard extremities of the double bottom. In effect the double bottom is further extended by water-tight compartments forward and aft beneath the ram-plate and steering-engine flats, which serve also as trimming tanks.

There are 63 coal bunkers, two tiers of 10 each on each side and one midship bunker above the protective deck, and one tier of 11 on each side below the protective deck. Their total capacity in tons of 42 cubic feet is 1,279.66. The bunkers can be filled either through adjustable chutes which deliver into the inboard upper bunkers from the spar-deck, or through coaling ports on the berth-deck which deliver into the outboard upper bunkers and into the passages. There are hinged sections of the protective deck underneath the coaling ports for filling the lower bunkers. The coal in the upper bunkers is struck below through these openings in the protective deck. There are elaborate overhead trolleys throughout the bunkers.

There are no outside ash-chutes, the ashes being discharged through inside pipes which lead down from the gun-deck near the side and pass through the side near the berth-deck.

The NEW YORK having been completed and the Secretary of the Navy notified by the Cramp Company of readiness for the contract trial, a Board, of which Admiral George E. Belknap was President, assembled at the Shipyard on May 10, 1893, to conduct the trial, and on May 16th the ship sailed for Boston, where she arrived the 18th. The measured course off the south shore of Long Island on which the PHILADELPHIA was tried having proved inadequate, the Department selected a new one between Cape Ann and Cape Porpoise, on the New England Coast, where a distance of 41.6 knots was triangulated, and marked by terminal buoys. The depth of water on this course, as shown by the hydrographic chart, varies from 23 to 57 fathoms. The trial draught of the ship being 24 feet or four fathoms, it follows that the water she had to run in varied from less than six times to fourteen times her draught. The highest authorities on propulsion and resistance agree that for high speeds (say above 16 knots) a vessel should have not less than twenty times her own draught of water under her to guarantee her best performance; that is to say, the best ratio of speed to power developed.

This fact was emphasized by the experience of the NEW YORK to an extent which attracted the attention of the members of the Board, as exhibited by an extract from the elaboration of their Report, by P. A. Engineer, E. R. Freeman, and Assistant-Engineer M. A. Anderson, U. S. N., published in the "Journal of the American Society of Naval Engineers." The synopsis of the steam log having shown that the maximum indicated horse-power was attained with less than the maximum of revolutions, the engineers naturally sought the cause, with the following results, as stated by themselves: "It will be observed that there is an apparent anomaly in the data of the maximum performance, the revolutions being less than the average for the whole four hours. An investigation of this led to the discovery that the data for another period in the trial showed the same anomaly, and, furthermore, that during these two periods, the ship passed over the same part of the course. The anomaly was then very reasonably explained by the fact that the depth of water, at this particular part of the course (as made by the ship) was from fifteen to twenty fathoms less than elsewhere. Thirty-seven fathoms was the depth (according to the chart) at this part."

The noteworthy feature of the NEW YORK'S machinery is the arrangement of four separate engines in indedendent water-tight compartments working in pairs on two shafts, and provided with sliding collar-couplings by means of which the forward engine on each shaft can be engaged with or disengaged from the after engine in a few minutes. These couplings are located in the after engine-rooms, but can be operated from either room at will. The coupling-length of shafting passes through the water-tight bulkhead separating the forward and after engine compartments in a stuffing-box. The manipulating gear of all four engines is inboard, and the arrangement of the compartment doors is such that when they are all open the engineer in charge can observe the operation of all four gears from a station at the middle intersecting door.

Collective I. H. P. of all main engines, air and circulating pumps	17,025.50
Total I. H. P. of all machinery in use	17,401.42

In surveying the NEW YORK'S performance, the attention of engineers will first be drawn to the enormous slip of her screws at maximum power. It was nearly twenty-five per cent. as a mean of the four-hour run, and in the shoalest water it was considerably more than twenty-five per cent. The speed curve, when it reached the highest point, became so nearly a straight line that its sweep was imperceptible to the naked eye, showing that the maximum of screw propulsion for that form of immersed body in that depth of water had been nearly reached. The experienced engineers who conducted the trial estimated that not less than 12,000 additional indicated horse-power would have been required to drive her one knot faster than she was then running, and of course this would have been impossible within practicable machinery spaces and weights and coal-supply on her displacement.

But they also estimated that in deep water or off soundings in comparatively smooth water, where there would have been no drag-wave under her, the same power that gave her 21 knots on the shallow course off Cape Ann would have driven her easily 22. An engineer officer who was on the lower engine-room platform when she passed from 57 fathoms of water to 23, going at her maximum rate, says that the effect was a shock approximating an actual obstruction, and that its effect could be plainly felt in the floor-plates under his feet, as well as seen in the greatly increased quiver of the ship's body and vibration of the parts of the machinery. Even in 37 fathoms, as pointed out by Messrs. Freeman and Anderson, U. S. N., in their admirable report to the American Society of Naval Engineers, the effect was such as to create the maximum of indicated horse-power on less than the mean of revolutions; the meaning of which is that the increased resistance caused the mean effective pressure on the pistons to run up enough to more than counterbalance the decreased revolutions as a factor in computing the indicated power.

From these facts, which, by the way, will be emphasized by the subsequent experience of the COLUMBIA and the MINNEAPOLIS, it is clear that in compelling trials over the Cape Ann course, the Government has the advantage of the contractor to an extent amounting to from a knot to a knot and a half in premium, according to form and draught in any ship guaranteed to run twenty knots an hour or more.

That the extraordinary slip of the NEW YORK'S screws on the trial run was due to the abnormal resistance caused by the shoalness of the water is further demonstrated by the fact that while undergoing the coal consumption trial on her way home in deep water, she ran 16 knots an hour with only fifteen per cent. of slip. We might also call attention to the fact that the PARIS, of the American Line, which has nearly the same co-efficient of fineness as the NEW YORK, crosses the ocean at 20 to 21 knots with an average slip in deep water of nineteen per cent. We consider it conclusively demonstrated that the Cape Ann course is against the ship at the rate of at least 1 knot in 21; 1¼ in 22, and 1½ in 23. This means that the Government by using that course gets practically a 22-knot ship by paying for 21; a 23¼-knot ship by paying for 22, and a 24½-knot ship by paying for 23 knots of actual performance on trial. No such handicap is suffered by builders on the Pacific Coast whose ships are tried in the deep water of Santa Barbara Channel, or in England, where they have measured miles in 100 fathoms close to a bold shore.

Under such conditions, the official contract trial was run on Monday, May 22, 1893, the sea being smooth and the weather fine, the total elapsed time being 3 hours, 57 minutes, 50½ seconds, and the total distance run being 83.19 knots; the mean speed was 21.01 knots per hour, which, at the contract rate of $50,000 per quarter knot, earned a premium of $200,000.

The NEW YORK then returned to the ship-yard, where her battery was mounted, and, on August 7, 1893, she was commissioned by Captain John W. Philip, U. S. N. On the following January she sailed for Rio, where the disturbances caused by Admiral de Mello's rebellion made the presence of a considerable naval force of the United States desirable. She returned from this voyage in July, 1894, and her first service in home waters was to act as "stake-boat" for the MINNEAPOLIS, on the trial of the latter, July 14, 1894. After that she took the naval reserves out for practice. Upon the completion of Captain

Philip's cruise he was relieved by Captain Robley D. Evans, one of the most distinguished officers of the navy.

Early in June, 1895, the NEW YORK was ordered to join the European squadron temporarily as the flag-ship to participate in the representation of our navy at the international demonstration at Kiel in honor of the opening of the North Sea and Baltic Ship Canal.

While there she attracted universal attention, and was visited three times by the German Emperor, who dined aboard on one of these occasions and, after dinner, about midnight, inspected the machinery of the ship. In the course of his inspection, without any warning, William II. (who by the way was supposed to be, by courtesy, in command) suddenly ordered the forward and after engines to be disconnected, which to his amazement was done in two minutes and forty-six seconds. The German Emperor made an exhaustive inspection of the ship, and in all respects paid more attention to her than to any other vessel engaged in the demonstration. On her return trip she crossed in 242 hours under half boiler power and two engines, natural draught.

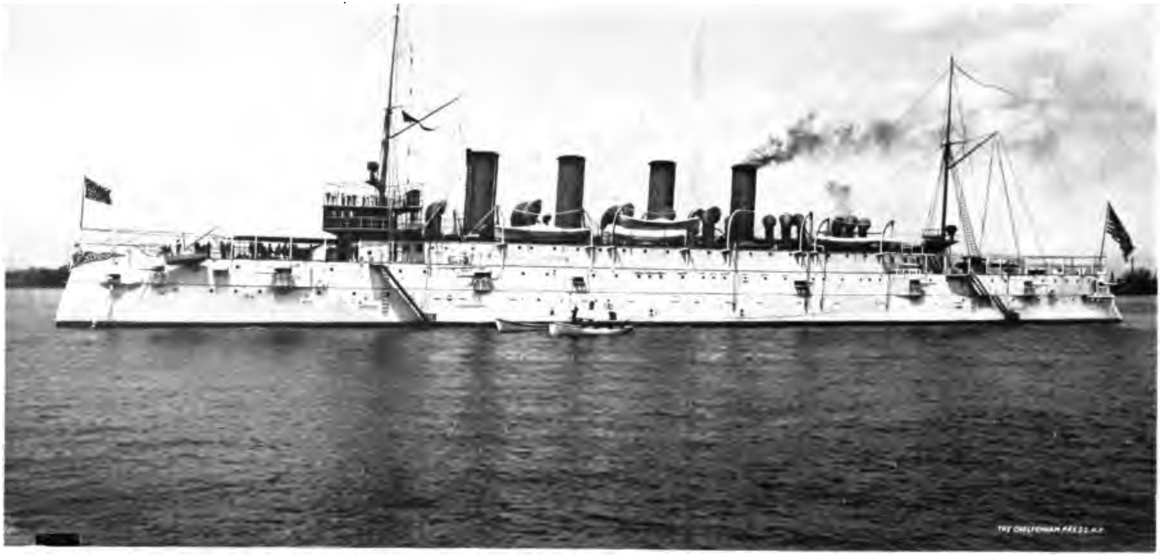
Soon after her return Captain Evans was transferred to the INDIANA, and was succeeded in command of the NEW YORK by Captain Winfield Scott Schley.

At the beginning of the war with Spain, the NEW YORK was selected as the flag-ship of the North Atlantic Squadron, at first under command of Rear Admiral Montgomery Sicard, who was soon succeeded by Commodore and Acting Rear Admiral William T. Sampson, her commander being Captain French E. Chadwick. On the 3d of July, when Cervera's squadron attempted to escape from the Port of Santiago, the NEW YORK was some distance off the station, the Admiral being on his way to confer with the Commander-in-Chief of the land forces.

This unfortunate circumstance deprived the NEW YORK of the opportunity of participating actively in the engagement, though she arrived upon the scene soon after the last of the Spanish ships—the COLON—had been beached by her commander to avoid capture.

After the war the NEW YORK remained the flagship of the North Atlantic Squadron; and quite recently, after eight years continuous service, and while the flagship of Rear Admiral Norman M. Farquhar, she was subjected to a speed trial at sea in which she developed a speed equal to that of her trial trip when new. This performance has thus far not been equalled by any vessel of the navy.

U. S. S. COLUMBIA



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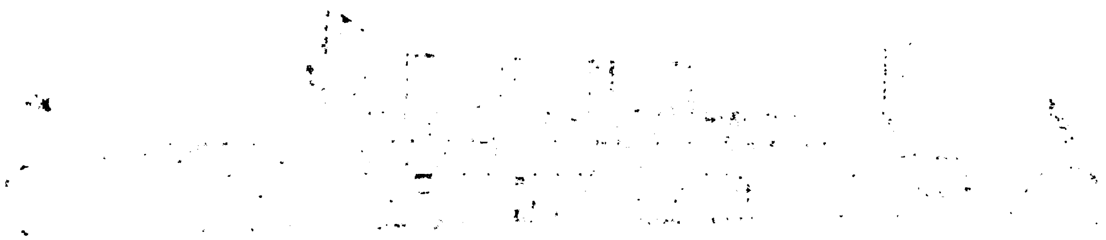
U. S. S. COLUMBIA

TWO combining high speed with large coal endurance in unarmored or protected cruisers, has been for several [illegible] the grand desideratum of naval architects [illegible] was realized in the BALTIMORE and PHI[illegible]s, but they were not large enough to c[illegible] extraordinary endu[illegible] was resolved upon, a[illegible] provision was made f[illegible] placement and 2[illegible] knots spe[illegible] ment, not more than $2,7[illegible] design was developed, officially known [illegible] No. 12," whose construction the Cramp Company undertook by contract, signed November [illegible] for $2,7[illegible]

This vessel, now known as the COLUMBIA, is 41[illegible] feet long on the load water-line, [illegible] feet extreme beam, 2[illegible] feet, and, at the normal draught, displaces 7,350 tons. Her power consists of three [illegible] vertical inverted triple-expansion engines, and [illegible] screws, one on the centre line as in single-screw [illegible] other two on the quarters as in twin [illegible]. The engines are in three separate water[illegible]s, the two driving the quarter screws [illegible] the same as in twin-screw ships, and the [illegible] the centre shaft just aft of them and h[illegible] one-half its power. Steam is supplied by [illegible] double-ended boilers, six of which are [illegible] inches diameter [illegible]



Cruiser COLUMBIA.

U. S. S. COLUMBIA

TO combine high speed with large coal endurance in unarmored or protected cruisers, has been for several years the grand desideratum of naval architects. High speed was realized in the BALTIMORE and PHILADELPHIA class, but they were not large enough to carry the coal-weights required for the extraordinary endurance sought. Hence a step in advance was resolved upon, and in the Act approved June 30, 1890, provision was made for a vessel of about 7,000 tons displacement and 21 knots speed, to cost, exclusive of armament, not more than $2,750,000. On this basis a design was developed, officially known as "Cruiser No. 12," whose construction the Cramp Company undertook by contract, signed November 19, 1890, for $2,725,000.

This vessel, now known as the COLUMBIA, is 412 feet long on the load water-line, 58 feet extreme beam, 22 feet, 6½ inches normal draught, and displaces 7,350 tons. Her power consists of three 3-cylinder vertical inverted triple-expansion engines, driving three screws, one on the middle line as in single-screw ships, and the other two under the counters as in twin-screw vessels. The engines are in three separate water-tight compartments, the two driving the counter screws being placed abreast the same as in twin-screw ships, and the one driving the centre shaft just abaft them and lapping each for one-half its width. Steam is supplied by eight four-furnace double-ender boilers, six of which are 15 feet, 6 inches diameter by

21 feet, 3 inches length, and two are 14 feet, 8 inches diameter, and 18 feet, 8½ inches long, together with two single-ender two-furnace auxiliary boilers, 10 feet, 1¾ inches diameter by 8 feet, 6 inches length. The total grate surface is 1,286 square feet, and the total heating surface 43,272 square feet. The cylinder dimensions are high pressure, 42 inches, intermediate 59 inches, and low 92 inches, with piston stroke 42 inches; and the weight of all propelling machinery, including water in the boilers, is 1,950 tons. The coal-supply on her normal displacement is 1,200 tons, but her maximum capacity is 2,200 tons, which, with liberal allowance for waste and "non-effective consumption," will give her at the most economical cruising speed, a radius of action of about 16,000 knots. This is much less than the official calculation, but experience will demonstrate that it is approximately correct.

Essentially and avowedly a commerce destroyer and not a fighting ship, the armament of the COLUMBIA is comparatively light. She carries one 8-inch B. L. R. 40 calibres long, aft; two 6-inch B. L. R. on the rapid-fire principle, with shield protection, forward on the upper deck, and eight 4-inch rapid-fire guns on the main or berth deck in 4-inch sponsons; with a secondary battery of eight 6-pounder and four 1-pounder rapid fire guns, and four Gatlings.

There is a 5-inch conning tower, with a 3-inch tube for communication. The protective deck extends the entire length of the ship, and is made up of two courses of 1¼-inch nickel steel, and on the slopes over the engine-rooms it is increased by an additional course 1½-inch thick, making the thickness of those parts 4 inches, and for the remainder of the deck 2½ inches.

The most noteworthy feature of the COLUMBIA at the date of her design (1890) was, of course, the application of her propulsive power through three screws. At that time the system of multiple screws was entirely experimental as a means of subdividing great engine power to produce high speed.

The French had made some trials with the CARPE, but she was only a steam launch provided with triple screws for model experiments. The results, however, had induced the French to design a triple-screw vessel of 6,300 tons, and 14,000 horse-power, which was the only predecessor of the COLUMBIA in this respect. The Italians had tried the system as early as 1886, in a torpedo cruiser, known as the TRIPOLI, of 800 tons; but as they afterwards eliminated the centre screw from this boat, it was assumed that they did not consider the system desirable. Under such conditions the Engineer-in-Chief of the Navy, George W. Melville, decided to distribute the 21,000 horse-power of the COLUMBIA through three screws. His reasons, as given in the Journal of the Society of Naval Engineers, were that the special advantages of triple screws are smaller size of separate parts of machinery, enabling higher rotative speeds to be employed with safety, and greater economy in ordinary cruising, when one engine working up to about its natural draught full power will give a fair cruising speed with economy of fuel. It is far from economical to run large twin-screw engines, designed for 19 knots and upwards, at speeds of 9 and 10 knots. Engine friction alone forms such a large percentage of the power developed, to say nothing of the increased cylinder condensation due to slower rotative speeds, that the economic performance, as measured by coal per I. H. P., is very low. The slip of the single screw will, of course, be enormously greater; but it was shown years ago by Chief Engineer Isherwood's experiments that a very large increase of slip may be attended with a very small reduction in total propelling efficiency.

To these may be added that, as the designed horsepower was in excess of that developed by any of our other vessels, and as no shafts had at that time been constructed in this country to transmit one-half that power, it was an additional advantage that triple screws would keep the stress on each shaft down to little over 7,000 I. H. P. It is also an incidental advantage that the chances of total disablement are still further reduced beyond the similar advantage in twin screws.

The COLUMBIA was completed and ready for trial November 10, 1893, and the following day she sailed for Boston, making the run from Cape Henlopen to Minot's Ledge, 408 knots, in 21 hours and 50 minutes, or a mean speed of 18.65 knots an hour under natural draught, with rather indifferent coal. Her steam on this run averaged about 124 to 125 pounds, and her I. H. P. about 12,000.

The trial course was practically the same as that run over by the NEW YORK, except that, in view of the greater speed of the COLUMBIA, it was made 2.37 knots longer, or 43.97 knots. The particulars of the contract trial which occurred November 18, 1893, were reported by Passed-Assistant Engineer Thomas F. Carter, U. S. N., in Vol. VI., No. 1, Journal of the American Society of Naval Engineers. This Report is a model professional paper, and by permission of its distinguished author we have drawn upon it freely.

The course was marked by a line of buoys, and a vessel was anchored close to each buoy as a marker and for taking tidal observations. The weather conditions were favorable. The vessel ran over the course from Cape Ann up, and also making a large turn, and without slowing of the engines, returned over the same course, the distance between buoys, the time and the mean speed being as follows:

Total time on course of 43.968 nautical miles, 1 hour 55 minutes, 6.1 seconds; mean speed for the run, 22.92 knots.

Total time on course, 1 hour, 56 minutes, 14.4 seconds; mean speed for the run, 22.70; mean apparent speed for both runs, 22.81 knots.

From this mean speed a deduction of .01 knot was made for the tidal correction, thus giving 22.8 knots as the official speed of the ship.

The condition of the machinery at the end of the trial was such that the trial could have been at once repeated, and probably with better results. Subsequent examination showed the boilers and engines to be in excellent condition.

The untrustworthiness of the patent log was clearly shown on this trial. The up run was made with two logs and the down run with one, the other having been carried away; the mean of the readings of both logs in one direction over the course and the reading of one log on the return run gave the length of the course as being 46.98 knots, or the average speed of the COLUMBIA was by patent log 24.34 knots, a point worth bearing in mind when one reads of the performances of foreign ships, the speeds of which for runs off the measured mile are usually recorded by patent log.

The small amount of horse-power required to give the speed of the contract trial can only be due to its application to three screws and to the fine lines of the hull. Very little wave is made by the vessel at high speeds, as will be noticed in the illustration, given herewith. The wake is not much different from that of fast twin-screw vessels.

The COLUMBIA'S performance is more remarkable than is generally known. She not only made a phenomenal speed, but did it with marked economy.

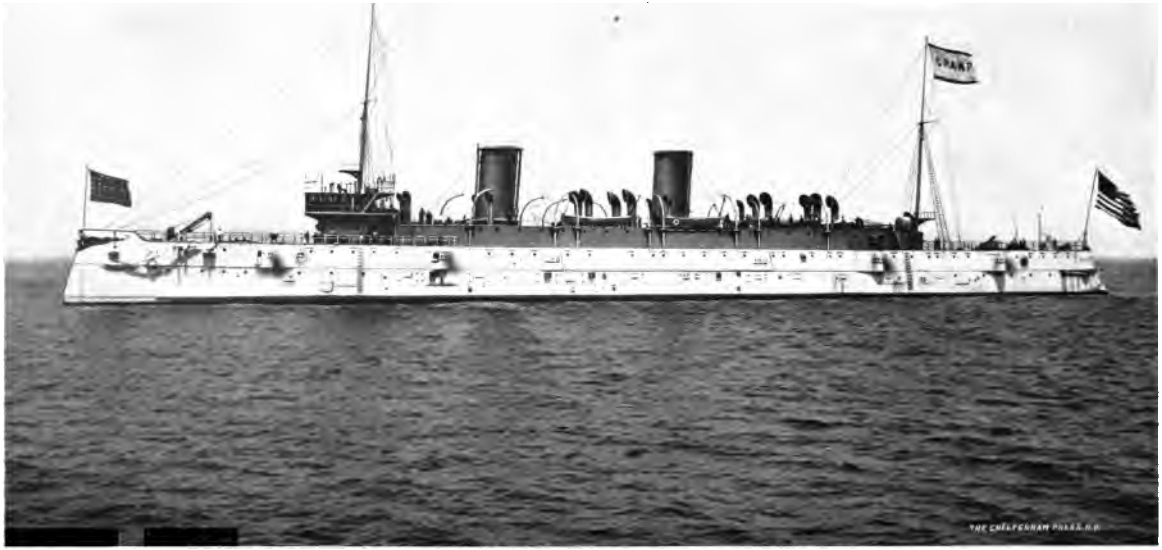
Returning to the shipyard upon conclusion of her speed trial the COLUMBIA was completed and commissioned under command of Captain George W. Sumner, U. S. N. She then remained at the League Island Navy Yard until ordered to New York to join the North Atlantic Squadron, whence she was sent to Bluefields, Central America, to protect the interest of the United States, pending strife between the Government of Nicaragua and the Mosquito Indians.

The COLUMBIA was selected to accompany the NEW YORK for the purpose of sharing in our representation at Kiel and, next to her consort, was the leading object of attention. After the demonstration was over the Secretary of the Navy directed that she be prepared for a trial run across the Atlantic, Southampton to New York, under natural draught. Her course was 3,090 knots in length and she went over it in 6 days, 23 hours, 49 minutes, or a mean speed of 18.41 knots an hour. Her runs by days were 405, 460, 462, 450, 455, 453 and 405 knots. Her average daily coal consumption was 212 tons. No other cruiser has ever remotely approached this performance.

During the Spanish War the COLUMBIA was employed in the service for which she was designed, namely, to cruise in search of the enemy's commerce, and to act as a scout for the fighting fleet, in which service she fully vindicated the wisdom of her designers.

The same is true of her sister ship, the MINNEAPOLIS.

U. S. S. MINNEAPOLIS



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U. S. S. [illegible]

T[illegible] under the [illegible] ing to [illegible]. The [illegible] awarded the contract to the [illegible] and the contract period was [illegible] of two years from that [illegible] of the sponson armor and [illegible] were [illegible] to extend the contract period [illegible] March [illegible]

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[illegible] by the following [illegible] comparison [illegible]

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[illegible]	[illegible] 67	[illegible]

Cruiser MINNEAPOLIS.

U. S. S MINNEAPOLIS

THOUGH the application of power through triple screws, as has been suggested, was still an untried device on any large scale, and the COLUMBIA herself was still unfinished, the Engineer-in-Chief was so sanguine of its success that he recommended a second vessel of that class in the winter of 1890–91, and the Act approved March 2, 1891, contained authority for her construction under the same conditions as those applying to her predecessor. The Secretary of the Navy awarded the contract to the Cramp Company, August 31, 1891, and the contract period was fixed at the unprecedented limit of two years from that date. Delay in delivery of the sponson armor and conning tower caused the department to extend the contract period ultimately to March 22, 1894.

When work was begun on the machinery of the MINNEAPOLIS, progress had been made with that of the COLUMBIA sufficient to suggest certain improvements, which were approved by the Engineer-in-Chief and adopted by the department.

The cylinder dimensions and working parts generally of the engines remained the same as the COLUMBIA'S, but the dimensions and steam-generating power of the boilers were augmented as shown by the following comparative table:

	COLUMBIA.	MINNEAPOLIS.
Six main boilers.....	15′ 6 11/32″ × 18′ 1¼″	15′ 9″ × 20′
Two main boilers....	15′ 0 13/32″ × 18′ 1¼″	15′ 3″ × 18′ 1¼
Two auxiliary boilers	10′ × 8′ 6″	2 10′ × 8′ 6″

	COLUMBIA. Sq. ft.	MINNEAPOLIS. Sq. ft.
Grate surface all main boilers......	1,352	1,458
Grate surface all auxiliary boilers......	66	66
Total grate surface...	1,418	1,524
Heating surface all main boilers......	43,268	47,539
Heating surface all auxiliary boilers...	1,917	1,917
Total heating surface	45,185	49,456

This increase was seven and one-half per cent. as to grate surface, and nearly ten per cent. as to total heating surface, with results that are now historical.

The COLUMBIA'S arrangement of an independent smoke-stack for each pair of main boilers abreast was changed in the MINNEAPOLIS to two larger stacks, each receiving the uptakes of two pairs of main boilers. This arrangement did not interfere with the draught, either natural or forced, and it materially enlarged the deck-room on both living decks, separating the uptake trunks by a wide space, whereas in the COLUMBIA the berth-deck is bisected longitudinally for over 200 feet amidships by a continuous trunk, interrupted only by the boiler-room passages. Taking both decks together, this arrangement in the MINNEAPOLIS increases the berthing space for the crew about twelve per cent. as compared with the COLUMBIA, besides materially improving the light and ventilation of the berth-deck.

In all respects other than these modifications the MINNEAPOLIS is similar to the COLUMBIA, so that the detailed description already given of the latter will apply for both ships.

The MINNEAPOLIS was ready for trial June 21, 1894, and on that date the department officially accepted the Cramp Company's formal notice of that fact. The usual preparations consumed the intervening time until the afternoon of July 9th, when she sailed for Boston.

The MINNEAPOLIS passed the first station on her trial run at 9 h., 44 m., 14.46 s., and completed the first run at 11 h., 39 m., 32.92 s. At 11 h., 58 m., 06.66 s. she crossed the line on the run south, and finished at A at 1 h., 51 m., 50.48 s., having made the run of 87.936 knots in 3 h., 49 m., 02.28 s. The tidal correction to be added amounts to 0.14139 knot, which gives the mean official speed of the ship at 23.073 knots per hour. The wind was light and variable, the sea smooth, the marks easily distinguishable, and all the conditions favorable to high speed.

The following table of comparative performance as between the MINNEAPOLIS and the COLUMBIA is instructive:

Ship.	Speed.	Pitch.	Mean Revolutions.	Mean Slip.	Mean I. H. P. (Propelling Engines.)
COLUMBIA.	22.810	21.5	181.72	18.27	17,991.11
MINNEAPOLIS.	23.073	Side, 22.0 Centre, 21.5	182.40	23.39	20,366.22

This table exhibits with graphic force the excessive cost of high speeds, and the mechanical difficulty of attaining them. It is observed that the MINNEAPOLIS ran faster than the COLUMBIA, say roundly a quarter of a knot. To do this she had to expend 2,375.12 more of indicated horse-power and the additional resistance caused a mean slip of her screws 5.12 per cent. greater than that of the COLUMBIA, measured by the unit; or, if measured by the relative percentages of slip it was 28 per cent. more.

The speed curve in the highest ordinates became almost a straight line, as was remarked in the case of the NEW YORK, showing that 23 knots is about the limit of speed for the MINNEAPOLIS form of immersed body in the depth of water on the Cape Ann course. The engineers who conducted the trial estimated that in 100 fathoms of water the slip with the same revolutions would be reduced to about 20 per cent., which would produce 24 knots an hour.

The MINNEAPOLIS earned, under the terms of the contract for her construction, a premium of $414,600, being at the rate of $50,000 for each quarter of a knot in excess of the guaranty of 21 knots. That a 23-knot ship is actually worth more than that sum in excess of the value of a 21-knot ship will be instantly admitted by every naval authority. But there has been so much and such gross misrepresentation of the nature and operation of the premium system, that we deem a brief review of it proper here. The whole subject was thoroughly investigated by the House Committee on Naval Affairs during the Second Session of the LIIId Congress, and the tenor of the committee's report was that of approval of the system. At the outset of this inquiry, Charles H. Cramp wrote a letter to the Secretary of the Navy, which was subsequently, by permission of the Secretary, made part of the proceedings of the committee and incorporated in its report (pp. 107–108). Its substance is as follows:

"The common supposition is that the policy of premiums and penalties had for its primary object the stimulation of efforts to produce excess of performance. Such, however, was not the object—except incidentally. The main object was to provide a convenient and equitable basis of settlement under a contract. The contracts for the earlier ships were drawn to guarantee a certain horsepower. Of course, prior to executing these instruments, their form and their construction under the law were exhaustively discussed.

"Mr. Whitney called the prominent shipbuilders, likely to build, in council, and being a shipowner himself, as well as a lawyer of large experience and extraordinary acumen, readily recognized the force of practical points when presented to him.

"For example, in the case of the BALTIMORE, the original scheme of form of contract provided simply for 9,000 indicated horse-power; an ironclad guaranty.

"I asked Mr. Whitney what would happen if she developed only 8,999.99 horse-power.

"After reflection he said he could not accept her under the contract if drawn that way, and invited a suggestion of remedy.

"I at once proposed the penalty system. That is to say a system of deducting a certain sum for every unit of power developed short of the guaranty, as was often done in both naval and merchant shipbuilding practice.

"He assented to this without argument, but said that in order to make the contract entirely equitable there should be a corresponding premium for excess of performance.

"It was well understood that in large marine engines performance could be estimated in advance only approximately. Hence in guaranteeing, say 9,000, it was necessary to work for considerably more in order to be on the safe side.

"When the basis of requirement was changed from I. H. P. to speed in knots, the penalty and premium system was applied to it, and was incorporated in the law, after much discussion. There were grave objections to the speed system, especially for large vessels of high power and deep draught, in consequence of the shallowness of the water along the coast. There is no 40-mile stretch on our Atlantic coast near enough to land to admit of accurate trial conditions with water enough to give fair play to ships like the NEW YORK or the COLUMBIA.

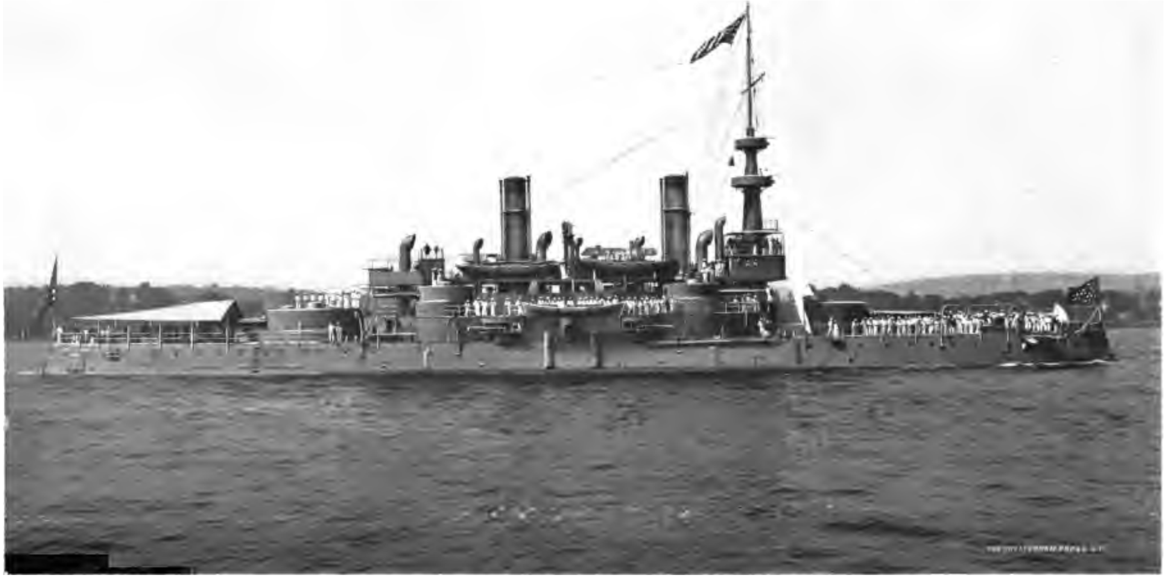
"The NEW YORK will run in smooth water off soundings 22 knots as easily as she ran 21 off Cape Ann. I also objected to the quarter-knot as the standard fraction. I asked that the words 'at the rate of' be put in, and in fact they were in the case of the MINNEAPOLIS and IOWA, though denied in the others. I then asked that the standard fraction be made one-tenth instead of a quarter knot, but was overruled.

"This is briefly the history of the adoption of the penalty and premium system. I desire to emphasize my prior statement that, so far as Mr. Whitney was concerned, the system was adopted primarily to afford a practicable basis of settlement and to give flexibility to the contracts within equitable bounds, and the question of stimulus was only incidental.

"There seems to be an impression in some quarters that premiums are a gift or donation. On the contrary, they are an essential element of the consideration involved in the contract, from the bidder's point of view. The limit of cost fixed by Congress, sometimes ample and sometimes scant, does not in the end affect the price, because each bidder would base his bid on the performance he thought he could attain. If the COLUMBIA and MINNEAPOLIS do not run more than 21 knots they will be losing jobs for us. It is plain, as I said before, that the penalty and premium policy acts simply to give flexibility and practicability to a contract system, which, without it, would be rigid, unpractical, and, in fact, impossible of successful execution."

The date of this letter was October 16, 1893, and hence before either the COLUMBIA or MINNEAPOLIS had been tried.

U. S. S. INDIANA, AND U. S. S. MASSACHUSETTS



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S. S. INDIANA, AND U. S. S. MASSACHUSETTS

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Battle-ship INDIANA.

U. S. S. INDIANA, AND U. S. S. MASSACHUSETTS

ONE of the first decisions reached by General Tracy, after he had assumed the portfolio of the Navy Department was, that the new Navy must include a number of heavily armored and formidably armed battle-ships of the first-class, capable of combat with any afloat, and, while primarily intended for coast defence, to possess sufficient sea-worthiness for extended cruises in case of offensive operations—on the well-established principle of naval strategy enunciated by Pitt, at the beginning of this century, when he said that, "the place to defend the shores of England is on the coasts of France." Secretary Tracy earnestly recommended that provision be at once made for construction of several such ships, and Congress responded by the Act approved June 30, 1890, authorizing "three coast-line battle-ships of about 8,500 tons displacement, etc., to cost, exclusive of armament, not more than $4,000,000 each."

The vessels were, however, planned on a scale considerably larger than that contemplated by Congress, so that, as advertised for bids, they were ships of 10,200 tons displacement. Their length on the load water-line is 348 feet, extreme breadth, 69 feet, 3 inches, and their draught at normal load displacement is 24 feet. When deep loaded with coal to their full bunker capacity, their displacement will be about 11,000 tons.

Their power consists of two vertical inverted, three-cylinder triple-expansion engines of about 5,000 indicated horse-power each, under forced draught, or 10,000 collective, actuating twin screws, and calculated to develop a speed of 15 knots an hour.

The protection consists of a water-line belt of harveyed nickel-steel armor extending through the machinery and boiler spaces, and the bases of the main or 13-inch gun turrets. This armor is 18 inches thick at the top of the belt and extending downward 4 feet, when it is bevelled to a minimum thickness of 8 inches at the bottom, the entire width being 7 feet, 2 inches. At each end of the water-line belt is an athwartship belt, 14 inches thick, completing the armored citadel. Forward and aft of the citadel the protection is a submerged flat deck of 3-inch nickel steel, extending to the stem, where it ends in the ram, and to the stern, where it forms a protection to the under-water steering-gear. A similar protective deck covers in the top of the citadel.

The athwartship belts are carried forward and aft to a segment of a circle amidships coincident with that of the main barbettes. These are of nickel steel (harveyed in the MASSACHUSETTS but not in the INDIANA), 17 inches thick, and rise 12 feet, 2 inches above the top of the citadel. The barbettes are surmounted by revolving roller-base turrets, 34 feet, 3 inches outside diameter and 7 feet high, of hardened nickel-steel plates 15 inches thick.

Between the main barbettes amidships a casemate of 4-inch armor is carried up to the upper deck, having at each of its four corners a circular barbette of 8-inch armor surmounted by a revolving turret of 7-inch plates. The conning-tower is 10 inches thick, forged hollow in one piece, and contains the usual steering-gear, speaking-tubes, etc.

The armament consists of four 13-inch B. L. R., 40 feet long, and weighing 63 tons each, mounted in pairs in the two main turrets; eight 8-inch guns mounted in pairs in the four smaller turrets on the upper deck; four 6-inch guns mounted in broadside in the upper casemate amidships, with a secondary battery of twenty 6-pounder and four 1-pounder rapid-fire guns and four Gatlings in the military tops. This forms the heaviest and most diversified armor and armament ever placed on any vessel of like dimensions, the weight of armor, exclusive of protection-deck, being 2,695 tons, and the weight of metal thrown at one complete discharge of the main battery, 6,680 ℔s.

Contracts for the construction of the INDIANA and MASSACHUSETTS were signed between the Secretary of the Navy and the Cramp Company, November 19, 1890, the contract price being $3,063,333 for each ship with three years contract-time for completion.

The INDIANA was launched February 28, 1893, the President of the United States and the then and the present Secretaries of the Navy being present. The MASSACHUSETTS was launched June 10, 1893. The accompanying cut shows the bow and launching platform of the ship at the moment of sawing off the sole pieces.

Unprecedented delays occurred in the construction of these ships, due to alterations in the character of the more important parts of their armor during the operation of the contracts. When the contracts were awarded in November, 1890, the armor was to be of plain nickel steel and that for the INDIANA was to be made at the works of the Carnegie Company. After the drawings and templates had been made for the side armor as originally designed with a double curvature, the vertical curve was dispensed with in March, 1892, and new drawings and templates were made. Three months later, in view of the evident inability of the Carnegie Works as then equipped to make the 17-inch and 18-inch plates for the barbettes and side-belts, the contract for this armor was transferred from the Carnegie Company to Bethlehem, and some lighter armor placed with the former Company in its stead.

The Bethlehem Company then proceeded to manufacture the heavy plates for the INDIANA, and when the group had been nearly completed and ready for test and shipment under the original conditions, the Secretary of the Navy, by letter dated August 25, 1893, announced his decision to apply the Harvey process to it. The Cramp Company, well aware that this would involve nearly if not quite a year of additional delay, at once proceeded to complete the ship as far as practicable without the side armor or the turret plates. Another cause of delay was the decision of the Department to have the conning-tower forged hollow in one piece, and several months elapsed from the date of this decision before the plant of the Bethlehem Company was prepared for work of that character.

The hull and machinery of the ship being in readiness for trial by March 7, 1894, her armor recess was planked in and her preliminary trial took place off the Capes of the Delaware the first week in March. This trial having been successfully completed, the Cramp Company, by letter dated March 23, 1894, notified the Department that the INDIANA would be ready for the contract trial May 7th and that it was desired to sail from the ship-yard for Boston on that date.

The Secretary of the Navy, however, decided not to permit a trial of the vessel without her side armor, which in August, 1894, had not been delivered, though it had been accepted by the Government and was nearly ready for shipment. As anticipated by the Cramp Company in August, 1893, the delay caused by the application of the Harvey process was almost exactly one year.

The Battle-ship **MASSACHUSETTS** *on the ways ready to be launched.*

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The official trial of the INDIANA took place on October 18, 1895, over the usual Cape Ann course. The results exceeded all anticipations. She had not been docked and painted for a year and a half, and her bottom had been cleaned only so much as could be done by divers. Her mean speed for four hours was 15.547 knots, and the maximum speed 16.26 knots. The average I. H. P. was 9,736.

She was commissioned by Captain Robley D. Evans, at League Island, November 20, 1895.

The MASSACHUSETTS was tried April 25, 1896, over the Cape Ann course. The trial, as usual, consisted of two runs, in opposite directions, over a measured distance of 31 nautical miles, six vessels being stationed at equal intervals along the course, to note the times of passing and make tidal observations. The sea was smooth, with a light E. S. E. breeze, and all the conditions for the trial were most favorable.

An addative average tidal correction of .0679 knot was calculated by the observers on the vessels at the different stations along the line, making the total the official average speed 16.2079 knots, and the premium earned $100,000.

The maximum performance was on the last fifteen-minute period of the run south, when the main engine and auxiliaries developed 11,440 I. H. P.

In the naval operations against Spain, the INDIANA and MASSACHUSETTS formed part of the North Atlantic Squadron.

At the battle of Santiago, the MASSACHUSETTS, under command of Captain F. J. Higginson, had the misfortune to be at Guantanamo coaling, and was thus deprived of a share in that brilliant victory.

The INDIANA, however, commanded by Captain Henry C. Taylor, was on her station at the mouth of the harbor, and bore an honorable part in the engagement.

U. S. S. BROOKLYN

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The *Armored Cruiser* BROOKLYN.

U. S. S. BROOKLYN

THE Act of July 19, 1892, provided for an additional armored cruiser of the general type of the NEW YORK, fixing the cost limit, exclusive of armament, at $3,500,000.

The Navy Department, in carrying this Act into effect, did not adhere closely to the type of the NEW YORK. As offered for the consideration of bidders, the new plan, officially known as "Armored Cruiser No. 3," represented a ship 400 feet, 6 inches long; 64 feet, 8 inches beam, and 41 feet, 3 inches moulded depth; having at 24 feet mean draught a displacement of 9,150 tons. The BROOKLYN is powered with four triple-expansion engines working in pairs on twin-screws. The dimensions and arrangement of the working parts of the machinery are similar to those of the NEW YORK. The battery consists of eight 8-inch guns mounted in four turrets, two on the middle line, forward and aft, and two amidships sponsoned on the sides; ten 5-inch guns mounted in sponsons on the gun-deck similar to the 4-inch gun mounts of the NEW YORK, and sixteen 6-pounder rapid-fire and machine guns. Her protection is a nickel-steel deck, 6 inches thick on the slope, and 3 inches on the flat; a water-line belt of 3-inch plates backed by a double streak of hull plating extends over the whole of the machinery space. Her 8-inch guns are protected by 10-inch barbettes, enclosing the bases of revolving turrets 6 inches thick. The sponsons for her 5-inch guns are 4 inches thick, and those for the rapid-fire guns 2 inches. The BROOKLYN is 20 feet longer than the NEW YORK, and her midship section is modified by an extreme tumble home of her top sides for a considerable distance amidships, to facilitate the construction and support of the barbettes and turrets for her four 8-inch guns on the broadsides. She also adds a top-gallant forecastle to the plan of the NEW YORK, and the barbette and turret for her forward pair of 8-inch guns are carried up through that deck so as to fire over it, thus bringing the axis of that pair of guns about thirty feet above the water-line.

Her military masts are larger than those of the NEW YORK, the foremast in particular being carried up to the first fighting top the full size of the conning tower. Another peculiarity of the BROOKLYN is the extraordinary height of her smoke-stacks, the tops of which are 100 feet above the lower grate-bars. The object of this device is to secure approximately the benefits of forced draught without air-pressure in the fire-rooms.

The distinguishing feature of the BROOKLYN is her enormous berthing space for the crew. The NEW YORK is exceedingly commodious and well ventilated, having two complete living decks—the berth-deck and gun-deck—extending the whole length of the ship; but the BROOKLYN exceeds her in this respect not only by twenty feet additional length on both these decks, but by a top-gallant forecastle 119 feet long, the space being clear fore and aft, except that taken up by the forward barbette, which occupies a circle on the middle line 19 feet, 8 inches outside diameter. Under the berthing-space regulations of the Navy the BROOKLYN could easily berth 1,000 men, or about double the number of her regular crew. This characteristic will give her unusual value for war service on distant stations, by enabling her to carry comfortably a considerable reserve force of enlisted men for any squadron of which she may be flagship.

Though, as already remarked, the machinery of the BROOKLYN is similar in type to that of the NEW YORK, there are some modifications worth noting. All the main columns are of cast steel, instead of cast iron as in the NEW YORK, whereby their weight is reduced about twenty-five per cent. The boiler arrangement differs entirely from that of the NEW YORK. The BROOKLYN has four double-ender, four-furnace boilers 18 feet long by 16 feet 3 inches diameter; one double-ender 20 feet long by 16 feet 3 inches, and two single-enders 9 feet, 5 inches long by 16 feet, 3 inches. The total grate surface is 1,017.76, and the total heating surface is 33,415 square feet, a ratio of nearly 33 to 7. She has no donkey boilers above the protective deck, steam for the auxiliary machinery being supplied from the single-ender main boilers. This arrangement involves 33,415 square feet of total heating surface, as against 31,005 square feet, and 1,018 feet of grate surface, as against 988 for the main boilers in the NEW YORK. The bunker capacity is about the same, but the BROOKLYN has arrangements for increased stowage of coal on the protective deck, making her maximum coal capacity about 300 tons greater.

The official speed trial of the BROOKLYN took place on Thursday, August 27, 1896, on the measured course off the New England coast, between Cape Ann and Cape Porpoise. The weather was fine and the sea smooth, making the conditions most favorable. The first run over the course was made in 1 hour, 54 minutes, and 42.52 seconds. The turn, made without change in the speed of the engines, occupied 20 minutes and 53.85 seconds. The return run was made in 1 hour, 52 minutes, and 26.34

seconds. A tidal correction, applied to the 83-mile course, reduced the latter to 82.953 nautical miles.

The machinery worked smoothly and without water on any journal, except that circulating through the bearings. Indicator diagrams were taken every half hour from each main cylinder, and once an hour from the main air and circulating pumps. No difficulty was found in keeping the steam pressure up to the desired point without running the blowers at too high a speed. The ease with which the steam pressure was maintained was no doubt due, in a great measure, to the high smoke-pipes. All boilers were in use and under forced draught.

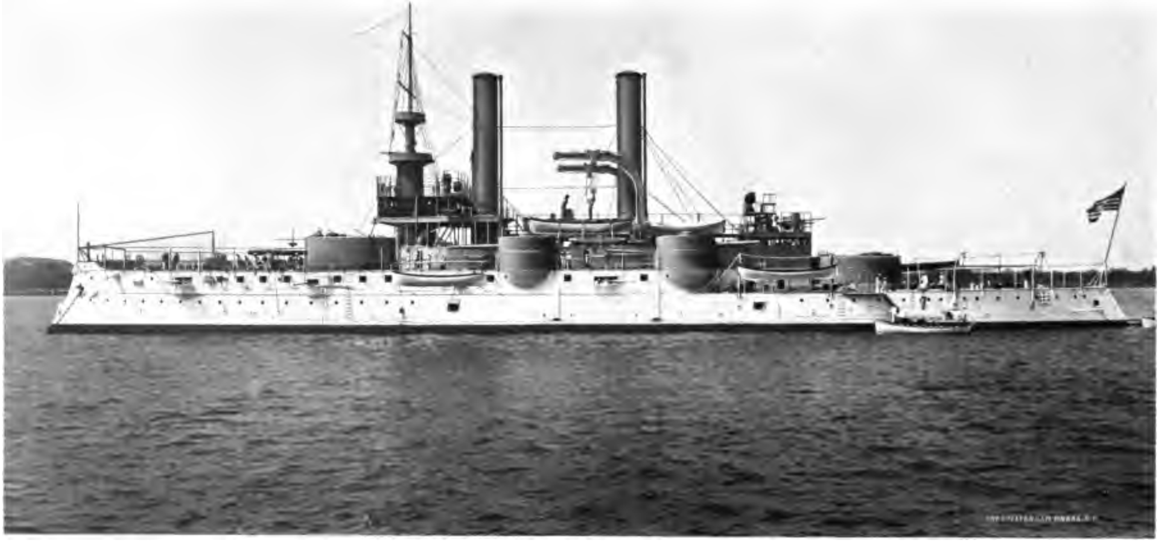
The performance of the BROOKLYN was a mean speed for four hours of 21.9 knots, exceeding the guarantee by 1.9 knots, and earning a premium of $350,000.

Soon after the trial she was commissioned by Captain Francis A. Cook, U. S. N., and her first service was to represent our navy in the international naval demonstration at Portsmouth, England, on the occasion of the Queen's Diamond Jubilee.

In the Spanish War the BROOKLYN was Flagship of the second in command of the North Atlantic Squadron, Commodore and Acting Rear-Admiral Winfield Scott Schley. When the Spanish fleet came out of Santiago, Rear Admiral Schley was temporarily in command by reason of the absence of the Commander in Chief previously mentioned. The direction taken by the Spanish fleet brought all the powers of the BROOKLYN and of her officers and crew into full requisition, and it is universally conceded that her part in the action was the most conspicuous and effective of all, she being the only ship whose personnel suffered any casualties whatsoever; also the only one to any appreciable extent damaged by the enemy's fire. Her successful pursuit and destruction of the COLON—a ship although somewhat smaller still much more heavily armed and armored—was the most striking event of the day. She was vigorously and effectively supported by Captain Charles E. Clark in the Battleship OREGON.

After the peace the BROOKLYN was sent to reinforce the Asiatic fleet, and is now the Flagship of the Commander-in-Chief there.

U. S. S. IOWA



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U. S. S. IOWA

THE Act of [illegible] authorized the construction of [illegible] -ship." This [illegible] in the pro- [illegible] [illegible]

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six inches thick at [illegible] of this belt are joined by athw[illegible] Harveyed nickel steel [illegible] to a segment of a circle [illegible] centre [illegible] the [illegible] superimposed rec[illegible] for

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Battle-ship IOWA.

U. S. S. IOWA

THE Act of July 19, 1892, authorized the construction of "one sea-going Battle-ship." This was to some extent a new departure in the programme of naval reconstruction, as those hitherto authorized had been designated as "coast-line battle-ships." Plans and specifications having been prepared in accordance with this Act, the contract was awarded to the Cramp Company on February 11, 1893, for the construction of a vessel officially known as "sea-going Battle-ship No. 1," and to be named the IOWA.

The dimensions of this ship are as follows: Length on the load water-line, 360 feet; extreme breadth, 72 feet, 2½ inches. Moulded depth, 39 feet, 4⅝ inches. Mean draught, 24 feet. Displacement on normal draught, 11,300 tons, and, with full coal-supply, about 12,500 tons. The guaranteed speed was 16 knots under the usual four-hour trial conditions, with premium of $50,000 for each quarter knot excess of speed above the contract guaranty.

The armor protection of the ship consists of a water-line belt of Harveyed nickel steel, 14 inches thick on 12 inches of wood backing extending over a length of 186 feet amidships, and 7 feet, 4 inches wide, tapering below the water-line to six inches thick at the lower edge. The ends of this belt are joined by athwartship belts of 12-inch Harveyed nickel steel worked diagonally from each side to a segment of a circle in the centre corresponding with the radius of the superimposed redoubts or barbettes. Forward and aft of the diagonal belts submerged protective decks extend to the ends, 2¾ inches thick on the flat. At each end of the armored citadel thus formed rises a circular barbette of 15-inch Harveyed armor, the after barbette being 8 feet, 9 inches high and the forward one 16 feet high. These barbettes support the main revolving turrets and protect the turning and loading gear. The main turrets are armored with 14-inch plates and have an inside height of 10 feet, 6 inches from the tops of the gun supports to the under side of the covering plates.

Above the water-line belt is worked for 100 feet of the length amidships a casemate of 4-inch armor with diagonal ends joining the main barbettes on either side and forming an upper citadel, from each of the four corners of which rises a barbette of 8-inch armor surmounted by a revolving turret 5½ inches thick. The armored conning-tower is 7½ inches thick, 8 feet inside diameter and 7 feet, 4 inches high in the clear.

The main battery of the IOWA consists of four 12-inch B. L. R., mounted in pairs in the two main turrets ; eight 8-inch B. L. R., mounted in pairs in the four turrets at the corners of the casemate ; six 4-inch B. L. R., mounted in sponsons or with shields, and twenty-two rapid fire and machine guns. The axis of the forward pair of 12-inch and all of the 8-inch guns are 26 feet, and of the after pair of 12-inch guns 18 feet above the load water-line ; so that, with the stability due to her great beam, she can fight her whole battery in any weather. Her full war complement will be 512 officers, seamen and marines. The contract price of the IOWA was $3,010,000.

The design of the IOWA is an enlargement upon the INDIANA class in length, beam, and deck arrangement but the disposition of the battery is the same except that she carries four 12-inch guns where the INDIANA carries four 13-inch, and six 4-inch guns as against the INDIANA'S four 6-inch, and her secondary battery is twenty-two rapid fire and machine guns as against twenty-eight of similar calibres in the INDIANA. In a word, though the IOWA is the larger ship of the two her armor and armament are both lighter than those of the INDIANA. These differences in plan are based upon the fact that while the INDIANA is intended as a fighting ship pure and simple, with every other quality more or less subordinated to that of ability to give and take hard and heavy blows, the IOWA is designed to combine with the latter quality the attributes of an all-round sea-going cruiser.

The IOWA is 12 feet longer, 3 feet wider and on the same draught (24 feet) displaces 900 tons more than the INDIANA. The arrangement below the main deck is similar, but above it the superstructure is carried clear forward to the bow, forming a forecastle deck 98 feet long, which adds about fifty per cent. to her berthing space as compared with the INDIANA. The superstructure itself, aft of the bridge, has a skid and bridge-deck and the main deck abaft the superstructure is clear, as in the other battleships.

The difference of deck arrangement in detail is that in the INDIANA the main deck is the highest deck forward of the pilot-house, while in the IOWA there is an upper-deck which forms a forecastle forward, and is carried aft for a distance of 253 feet from the fore side of the stem at L. W. L. On the INDIANA there is a superstructure deck corresponding to this deck, which extends for a distance of 129½ feet amidships, commencing at the fore side of the conning-tower. Aft of this superstructure deck in the INDIANA and upper or forecastle deck in the IOWA the main deck is the highest deck. Both vessels have a narrow bridge-deck amidships, which widens out at the forward and after ends. The INDIANA'S bridge-deck is eleven feet above the superstructure deck, while the IOWA'S bridge-deck is 11½ feet above the upper deck. In the INDIANA the pilot-house is on the same level with the bridge deck, but in the IOWA it rests on an "upper bridge-deck," which stands 4½ feet above the level of the bridge deck and extends for a distance of 43 feet abaft the fore side of the pilot-house; the bridge-deck as in the INDIANA is omitted in the wake of the upper bridge-deck in the IOWA, thus making the head room between the upper deck and upper bridge-deck about 16 feet in the latter ship. All decks below the main decks, as already stated, are similar in both ships. The forward turret in the IOWA stands 9 feet higher than on the INDIANA, in order to enable the guns of that turret to fire over the upper deck.

The maximum coal capacity of the IOWA is 1,800 tons, and will give her a cruising radius of about 10,000 knots at the most economical speed.

The trial of the IOWA, through delays on the part of the Government, did not occur until April 7, 1897, when she made over the Cape Ann course a mean speed, for four hours, of 17.0871 knots, and earned a premium of $217,420.00, being at the rate of $50,000 per quarter knot for 1.0871 knots in excess of the guaranteed speed of 16 knots.

In the Spanish War the IOWA was assigned to the North Atlantic Squadron under command of that popular and picturesque sailor, then Captain, now Rear Admiral Robley D. Evans. She bore a most conspicuous part in the Battle of Santiago, and is mainly credited with the destruction of the Spanish Armored Ship the MARIA THERESA.

THE NEW AMERICAN LINE SHIPS
SAINT LOUIS AND SAINT PAUL

THE CHELTENHAM PRESS, N.Y.

American Line Steamship ST. PAUL.

THE NEW AMERICAN LINE SHIPS SAINT LOUIS AND SAINT PAUL

THE policy which produced these ships was inaugurated about the year 1891 by the President of the International Navigation Company, the only organization of American capital in the North Atlantic trade. Among the ships owned by that Company were the two great twin-screw greyhounds the NEW YORK and the PARIS, and Mr. Griscom proposed to Congress that if an Act were passed which would have the effect of admitting those ships to American registry he would cause two other vessels of at least equal tonnage to be built in the United States. A bill to this effect was introduced in the House of Representatives by Hon. W. Bourke Cochran, of New York, and became a law in 1892; when the International Company immediately placed an order with the Cramp Company for the vessels required to meet its provisions.

The first frames were raised on the 27th day of July, 1893.

It is worthy of note that both these ships are built of domestic material throughout, hulls and machinery. As soon as their construction was determined, strenuous efforts were made by British rolling mills, forges, and foundries to obtain orders for their material, and remarkably low quotations were offered. But the Cramp Company, for mechanical reasons not necessary to explain, and actuated by its traditional policy of patronizing and developing

American industries, rejected all foreign offers and placed its orders for every pound of material with American manufacturers. This was so completely true that Charles H. Cramp, President of this Company, was enabled with much pride to say, in a paper on the "Evolution of the Atlantic Greyhound," read November 16, 1893, before the American Society of Naval Architects and Marine Engineers:

"And now, in conclusion, let me remark that the ships are American from truck to keelson. No foreign materials enter into their construction. They are of American model and design, of American material, and they are built by American skill and muscle."

The principal dimensions and qualities of these ships are as follows:

Length between perpendiculars	535 feet, 8 inches.
Length over all	554 feet, 2 inches.
Extreme beam	62 feet, 9 inches.
Depth from first deck to flat keel	42 feet, 4 inches.
Depth of hold for tonnage amidships	23 feet, 2 inches.
Height of bow above water-line at load draught	39 feet.
Number of decks	5
Number of watertight compartments exclusive of ballast tanks	12
Gross register	10,700 tons.
Load displacement (about)	15,600 tons.
Dimensions of main dining-saloon	109 feet, 4 inches × 46 feet.
Dimensions of second cabin	39 feet, 6 inches × 56 feet.
Seating capacity of main saloon	322
Seating capacity of second cabin	208
Berthing capacity of steerage (about)	900

The propelling machinery is a pair of vertical inverted quadruple-expansion engines, to carry a working steam-pressure of 200 pounds and expected to develop from 18,000 to 20,000 collective indicated horse-power. These are the largest and most powerful marine engines ever built in America, and as the principle of quadruple expansion has never before been applied on so large a scale its results in this case will be watched with interest by the entire profession of marine engineering.

No attempt has been or will be made to predict the probable performance of these ships.

Structurally the art of Naval architecture has been exhausted in their design and the skill of the best mechanics in the world is being tried to the utmost in their construction. Whatever may be their performance as to speed and time of passage, nothing is hazarded at this stage of their progress in saying that in safety, seaworthiness, and comfort they will not be surpassed by anything afloat.

In the general public or patriotic sense the chief element of interest in these ships is the fact that they represent the inception of an effort to restore the prestige of the United States as a maritime commercial power. The condition of affairs existing at the time the New American Liners were projected was the culminating point of our feebleness on the ocean.

Now, for the first time in many years, domestic capital and enterprise are beginning to look to the ocean for a field of operations and to steamships as an object for investment.

While sea routes are almost numberless and many of them of vast importance in the sum total of the world's commerce, that of the North Atlantic, embracing the grand thoroughfare of trade and travel between the great powers of Europe and the northern half of the Western Hemisphere, well-nigh overshadows all the rest combined in value and volume of its transactions, and totally eclipses them in the character of its vehicles. To such an extent is this true that, of all the myriad of steamships afloat, not more than twenty or thirty are popularly known even by name, and these are the great vessels which, under the popular designation of "Atlantic Greyhounds," ply in passenger and express traffic between the United States and the principal nations of Western Europe. Plying on the thoroughfare of chief intercourse between civilized nations, they come and go constantly fraught with the most valuable lives in both hemispheres, and for that reason, if for no other, their every performance is eagerly watched by the universal public until their names and the lines to which they belong have become household words.

During the period under discussion—say from 1871 to the present time—the prime effort of these transatlantic competitors has been to reduce time required in passage, and while of course other qualities, seaworthiness, comfort and luxury of appointments, have held an even pace in the general contest for supremacy, the effort to augment speed has been so marked and so persistent as to create the aspect of a perpetual race, in which the development of the steamship has become an object enlisting the art and skill of the most masterful minds, and where each successive "lowering of the record" marks a triumph for designer and builder, a fame world-wide, and substantial benefit to mankind.

Under these circumstances it is not too much to say that the grand contest for supremacy on the international race-course of the North Atlantic has ennobled the vocation of those who plan and build ships and of those who manage them to a grade which abates none of its pride by comparison with any other field in which the human intellect has ever held sway.

The SAINT LOUIS was completed the last week in

May, 1895, and sailed from New York on her first voyage June 5th.

The SAINT PAUL was completed at the end of September and sailed on her first voyage October 9, 1895.

They have proved to be all that was expected of them; safe, commodious, comfortable, luxurious and fast; free from vibration, and among the stanchest, stablest, and ablest sea-boats afloat.

A striking instance of the latter quality occurred in a recent passage when, the SAINT LOUIS and CAMPANIA being abreast in a gale heavy enough to buffet and knock down the speed of the latter, the SAINT LOUIS ploughed through it at nearly full speed without the slightest distress or discomfort.

The record time of the SAINT PAUL, west bound, is 6 days, no hours and 31 minutes; average speed for the entire run 21.08 knots.

The record time of the SAINT LOUIS, east bound, is 6 days, 10 hours and 14 minutes; average speed 19.95 knots.

Later constructions, both English and German, have lowered these records slightly, but the SAINT LOUIS and SAINT PAUL maintain their original popularity among transatlantic travellers.

THE KROONLAND AND FINLAND

THE KROONLAND AND FINLAND

SO far as size is concerned, these two vessels for the International Navigation Company are the most important ships built at Cramp's Shipyard.

They belong to a class of Transatlantic Steamships which during the past few years has become exceedingly popular with the travelling public. That is to say, vessels having all the comforts, and even the luxurious appointments, of the great Ocean Greyhounds, are not powered for exceedingly high speed, but make eight- or nine-day trips, carrying large cargoes of general freight as well as passengers.

They are twin-screw steamers with a length between perpendiculars of 560 feet, depth 42 feet, and a gross tonnage of about 12,000. In all departments of construction this vessel is fully up to, and in many cases exceeds, the requirements of Lloyds and the British Board of Trade, as well as those of American law. There are eleven water-tight bulkheads, so arranged that flotation may be maintained with any two compartments full of water. Special attention has been given to the construction of these bulkheads, which are stiffened in accordance with the requirements of the bulkhead committee of the Board of Trade. If they should be needed for service in time of war, the disposition of the bunkers would give coal protection to the boilers, while safety from breakdowns is practically assured by the adoption of twin-screws, which are fitted with enclosed shaftings and brought close together by the adoption of a small aperture in the stern frame.

Below the main deck, the hold and 'tween decks of the vessels are devoted to the carriage of cargo and stores, with the exception of a space amidships comfortably fitted for the firemen. This portion contains a promenade and is fitted with sheltered seats—a wise and thoughtful provision for their comfort. There is also a small space aft for the use of the stewards. There is a cubic capacity sufficient for some 11,000 tons of cargo, and tanks are provided for more than 200 tons of fresh water, in addition to what may be condensed en route. The store-rooms are spacious and well arranged for the large quantities of provisions that will be carried. They include refrigerated chambers for meat and other perishable articles.

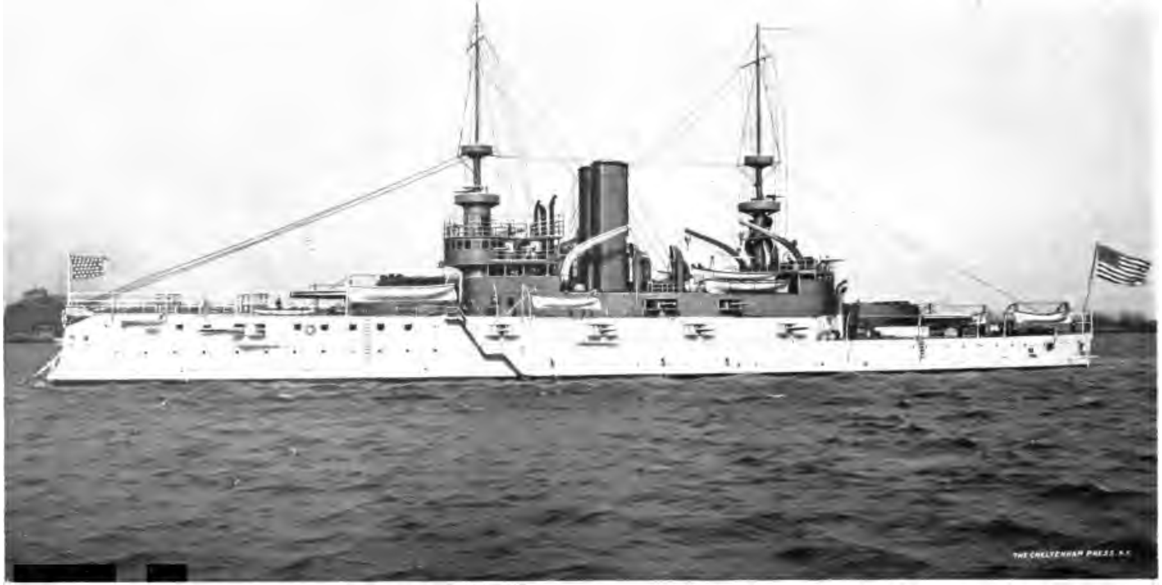
The main deck is given up to passenger accommodations. At the forward end are three compartments for third-class passengers, the men's quarters, and at the after part of this deck are the compartments for the married third-class passengers, who are berthed in state-rooms containing two, four, or six berths. These quarters have well lighted dining-rooms. Every compartment has a wide companionway leading to the houses on the upper deck, which contain the lavatory and sanatory accommodations, also giving access to the promenades on that deck. On the upper deck, amidships, are state-rooms for 106 first-class passengers. On this deck is also the first-class dining saloon, situated between the funnels, and extending the full breadth of the vessel. It can seat 208 passengers. The furniture is mahogany, except the sideboards which are of satinwood inlaid with various woods. For lighting and ventilation, in addition to the large and numerous side-lights, there is an unusually large trunk-well extending through two tiers of decks and tastefully decorated in white, with a richly ornamented glass roof. The seats are covered with moquette and the upholstery throughout is in excellent keeping with the color scheme of the other decorative materials. Aft of this saloon, and between it and the second-class dining saloon, are situated the galleys, sculleries, and pantries, so arranged that ready service can be given to either class of passengers and fitted with all the best and latest appliances, most of which are of American make. The second-class dining saloon comes next and also extends the full width of the ship. It can seat 120 passengers and is panelled with tapestry upon a soft cream white ground. The furniture is in mahogany, and carpets, cushions, and curtains are in varying shades of one color, giving a very pleasing effect. There are state-rooms for 76 second-class passengers aft of this saloon.

Coming to the upper deck and starting forward, there is a long forecastle fitted up for the accommodation of crew and petty officers with hospitals and lavatories for steerage passengers. Amidships is a bridge-house 220 feet long with staterooms for 204 first-class passengers at the forward end and 120 second-class at the after end. These state-rooms are large and excellently lighted and ventilated. In a deck-house aft is the social room for third-class passengers. The deck above is the promenade deck which is sheltered by the permanent deck formed by the boat deck. Hereon are located the first-class library and smoking-room, as well as suites and special cabins. These rooms are in deck houses, lighted by Mullen's patent rectangular windows with ventilating stained glass panels in the upper part. The sanatory accommodation for all classes of passengers is well arranged, and distributed rather than concentrated. There can be carried altogether 342 first-class, 194 second-class, and about 1,000 third-class passengers. The navigation officers' cabins are placed above the promenade deck and at the fore-end of the boat deck; and above their deck-house is a spacious bridge, giving a clear view over the whole vessel and well sheltered by a strong steel bulwark.

There are altogether twenty boats, including four patent collapsible ones. The lifeboats are of steel, and are carried in the usual manner under davits. Each is fitted with patent disengaging gear. The arrangements for loading and discharging cargo are very complete. There are nine hatches, each having its own winch and derrick with the necessary fittings to insure rapid handling. The upper deck hatches are fitted with dished steel covers instead of the usual wooden ones. The winches, windlasses, and warping capstans are of American make. The steam steering gear is controlled by telemotor from the wheelhouse on the navigation bridge.

The ships are lighted throughout by electricity, the installation being fitted by the builders, as is also a complete system of electric bells. The generating plant is situated in a large room convenient of access from the engine-room, and consists of four dynamos driven by engines of the Sturtevant Company, of Boston, whose system of artificial ventilation will be installed in addition to the usual cowl ventilators above deck.

U. S. S. ALABAMA



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The Battle-ship ALABAMA.

U. S. S. ALABAMA

ON October 2, 1896, the Cramp Company contracted with the United States to build a first-class battle-ship, authorized by the Act of June 10, 1896.

The principal dimensions of the ALABAMA are:

Length on load-water line..........	368 feet
Beam extreme......................	72 " 2½ inches
Mean draft, in sea-going trim.......	23½ "
Displacement, sea-going trim	11,562 tons

Armor.—A side belt of hardened nickel-steel extending 3½ feet above the load-line to 4 feet below it, the plate being bevelled from 16½ inches at the upper edge to 9½ inches at the lower or under-water edge.

Forward of the citadel the water-line is armored with a belt tapering to 4 inches in thickness at the bow.

The casement armor above the belt and the armor of the superstructure are 5½ inches thick. The barbettes are 15 inches thick at the point and 10 inches thick at the rear.

The main turrets have armor 14 inches thick.

The forward conning-tower is 10 inches thick and 7 feet high; and the after conning-tower or signal station is 6 inches thick, forged in one piece.

The Main Battery consists of: Four 13-inch breech-loading rifles, 35 calibres, mounted in pairs in two balanced turrets, on the fore and aft centre line of the ship, on the main deck; ten 6-inch rifles on the main deck, mounted in broadside; four 6-inch rifles on upper deck, firing ahead and astern and in broadside.

The Secondary Battery consists of: Six 6-pounder Hotchkiss guns; two 6-pounder Maxims on bridge deck; eight 6-pounder Maxims on bridges; two 3-inch field guns; two 1-pounder Hotchkiss guns; four 1-pounder Maxims; four Colt 6-mm. automatic guns.

There are four torpedo-tubes, two on each side, discharging directly from the berth deck. The turret-turning and breech-gear of the 13-inch guns are operated by electricity. The 6-inch guns are worked by hand on central-pivot carriages.

Engines.—There are two 3-cylinder triple-expansion vertical engines driving twin screws. Steam is supplied by eight single-ended cylindrical boilers, 9 feet 11 inches long and 15 feet 8 inches outside diameter.

Contract Signed.—September 24, 1896.

Contract Price.—$2,650,000.

Collective indicated horse-power of main and auxiliary engines during the trial, 11,365.

Official Speed-Trial.—The official speed-trial took place off the New England coast on August 28, 1900. It consisted of two runs over a measured course of 33 nautical miles. The average speed of the two runs was 17.013 knots per hour. The weather was good, the sea smooth, the wind light. All boilers were in use under forced draught. All the steam generated was used by the main engines and auxiliaries, except that used in the steering engine and in the engine for the dynamo to light the engine and boiler compartments. The coal used was hand-picked Pocahontas. The boilers steamed freely and steadily. The engines and auxiliaries worked well.

After the trial, the boilers, main engines, and auxiliaries were examined and found in good condition. The ALABAMA was then placed in her first commission under Captain Willard C. Bronson and attached to the North Atlantic squadron.

IMPERIAL JAPANESE CRUISER
KASAGI

IMPERIAL JAPANESE CRUISER KASAGI

ON December 31, 1896, the Cramp Company contracted with His Excellency, Toru Hoshi, Japanese Minister to the United States, on behalf of His Majesty the Emperor of Japan, for the construction of a protected cruiser of the following general dimensions and qualities:

Length between perpendiculars.....	374 feet 6 inches
Breadth, moulded.................	48 " 9 "
Depth, moulded...................	30 " 6 "
Mean draught of water............	17 " 9 "
Displacement of that draught......	4,900 tons

This vessel is equal in materials and workmanship to vessels of the corresponding type in the United States Navy.

The motive-power is two vertical inverted triple-expansion four-cylinder engines, driving twin screws, to develop, under forced draught equal to two inches of water in the gauge, a collective indicated horse-power of 17,000, and to drive the ship at a mean speed of 22½ knots an hour in four runs (two each way) over a measured course ten knots in length.

Steam is supplied by twelve single-ended three-furnace steel boilers 14 feet 2 inches in diameter and 9 feet 9 inches long, and calculated for a working pressure of 155 pounds to the square inch.

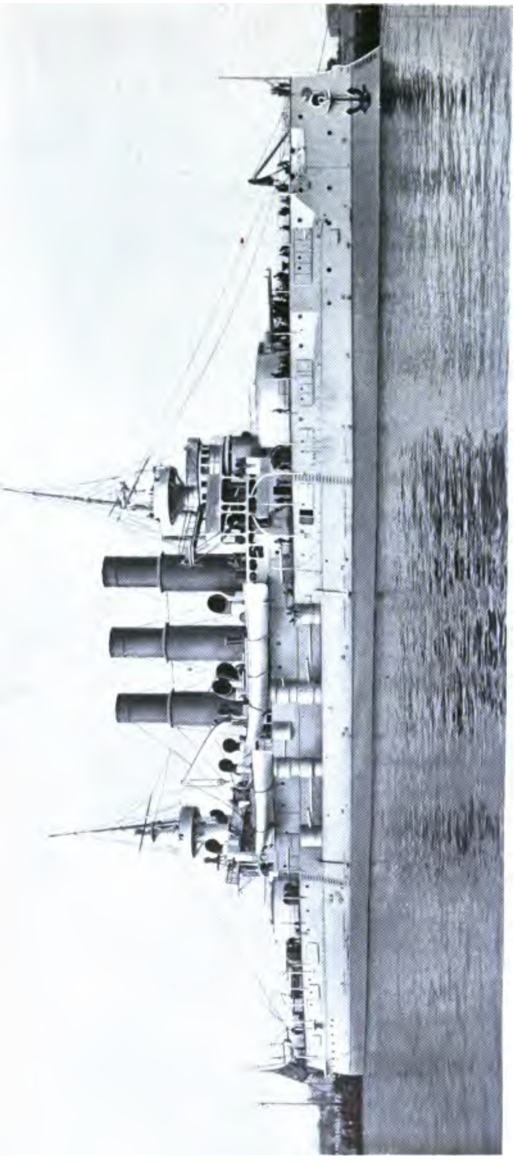
The armament of the KASAGI is two 8-inch quick-firing rifles, mounted singly on the middle line forward and aft, and protected by shields; ten 4.7 inch quick-firing rifles mounted in broadside, with secondary battery of twelve 12-pounder quick-firers and six 2½-pounder Hotchkiss guns. There are five torpedo-tubes for 14-inch torpedoes.

The vital parts of the KASAGI are protected by a steel deck having a maximum thickness of 4½ inches on the slopes and 1¾ inches on the flat, beginning four feet below the load water-line and rising to a height of one foot above it.

It seems proper to say that in no respect of plan, construction, or arrangement is the KASAGI excelled by any vessel of her type and class, while but few equal her. When completed and commissioned she proved creditable in the highest degree to the enterprise and wisdom of the nation for whose service she was built.

She exceeded all her contract guarantees of performance, on trial, and has since been one of the most active, efficient, and economical cruisers in the navy of Japan.

IMPERIAL RUSSIAN BATTLE-SHIP RETVIZAN AND PROTECTED CRUISER VARIAG



Imperial Russian Battle-ship RETVIZAN.

This plate of the RETVIZAN *shows the signal masts lowered to pass under the Brooklyn Bridge.*

IMPERIAL RUSSIAN BATTLE-SHIP RETVIZAN AND PROTECTED CRUISER VARIAG

IN 1893, Vice Admiral Nicholas Kaznakoff visited this country in command of a Russian Squadron. During his stay here, he thoroughly examined the work in hand for the United States Navy, and expressed to the President of the Cramp Company the opinion that the Imperial Russian Government would be inclined to place orders here for two or more ships upon suitable application.

This led to a considerable correspondence between Mr. Cramp on the one hand and Admiral Kaznakoff and other leading spirits in the Russian Navy on the other, with the result that at the beginning of 1898, Mr. Cramp proceeded to St. Petersburg, and after considerable discussion of plans, etc., two contracts were signed the 23d day of April, 1898, one for the construction of a first-class battle-ship called the RETVIZAN, and the other for a first-class protected cruiser called the VARIAG.

The following general descriptions exhibit the characteristics and qualities of the two ships:

IMPERIAL RUSSIAN BATTLE-SHIP RETVIZAN

Principal Characteristics.

Length on load-line	384	feet.		
Beam, extreme	72	"	2½	inches.
Draught, mean	24	"	7	"

Displacement, at 24 feet 7 inches.........	12,750 tons.
Speed per hour..........................	18 knots.
Indicated horse-power, mean of 12 hrs.....	18,225

Battery.—Four 12-inch 40-calibre B. L. R.; twelve 6-inch 45-calibre R. F.; twenty 75 mm. 50-calibre R. F.; twenty 47 mm. R. F.; six 37 mm. R. F.; two 2½-inch field guns.

Torpedo-Tubes.—One forward above water; one aft above water; two broadside above water; two broadside under water.

The hull is unsheathed and constructed on the cellular system, with inner bottom extending to the protective deck.

Water-tight floors and bulkheads divide the vessel into numerous water-tight compartments, any two of which may be filled without endangering the stability of the vessel.

The vessel carries the following armor, all treated by the Krupp process:

Main water-line belt for a length equal to two-thirds the length of the vessel and with a thickness of nine inches.

Casemate armor, six inches in thickness, extends above this to the line of the main deck, and armor of five inches extends to the line of the upper deck, protecting the six-inch guns. All this armor extends for two-thirds the length of the vessel.

Forward and abaft these limits, the vessel is fitted with nickel-steel armor two inches in thickness to the bow and stern respectively.

The 12-inch guns are mounted in turrets protected by armor nine inches in thickness, with barbettes extending to the protective deck eight inches in thickness.

On the upper deck, four of the 6-inch guns are mounted in armored casemates, and two of them fire directly ahead and two directly astern. The armor upon these casemates is five inches in thickness.

The 6-inch guns mounted in broadside are separated by splinter bulkheads of hard nickel-steel plates oil-tempered and annealed, two inches in thickness.

The conning tower, which is unusually large and roomy, is made of 10-inch Krupp armor, with a tube extending to the protective deck five inches in thickness.

All the ammunition hoists, smoke-pipes, and engine-hatch casings are protected by glacis plates of 1½ inches thickness.

The boilers are of the Niclausse type, twenty-four in number, and are arranged in four water-tight groups.

The engines for driving the twin screws are of the triple expansion type.

The protective-deck armor is so disposed that the flat or horizontal part is about three feet above the load-line, and slopes at the sides down to the armor shelf, the flat being two inches in thickness and the slopes three inches.

By this arrangement a shell penetrating the side armor would be opposed by the protective deck three inches in thickness, which it would have also to penetrate before it could enter the machinery or magazine spaces.

The speed of this vessel—18 knots for 12 continuous hours with open stoke-holes—was attained very satisfactorily on her trials.

The amount of coal carried at trial displacement was 1016 tons, and the coal-bunker capacity allows for a radius of action of 8,350 knots at 10-knots speed.

Accommodation is made for an Admiral and his staff, for a captain, 26 officers, 12 petty officers, and 740 crew.

The equipment of the vessel is most elaborate, the auxiliary machinery, as in the case of the VARIAG, being driven by electricity throughout.

The vessel is lighted by electricity, and is furnished with six powerful search-lights. Among other equipment, the vessel is furnished with the following boats: two 56-feet torpedo steam launches; two 40-feet torpedo steam launches; two 20-oar barges; two 16-oar cutters; two 14-oar cutters; two 6-oar whale-boats; two 6-oar yawls.

Store-rooms have been provided for storing provisions for four months, and ten days' supply of water. Very large and complete evaporating and distilling apparatus have been provided, both for purposes of drinking and making fresh water for the use of the water-tube boilers.

The vessel is supplied with every convenience for the comfort and health of the officers and crew, and is also fitted with very handsome metallic furniture.

The VARIAG was completed and delivered to Captain Vladimir Behr, the officer designated to receive her, at the end of the year 1900.

She went immediately to St. Petersburg upon leaving our waters in the early spring of 1901, and was received there with great éclat, the Emperor himself visiting the ship, examining her thoroughly, and expressing the highest satisfaction with her design, appearance, and workmanship.

Immediately afterward the Emperor further signified his satisfaction with the VARIAG by selecting her to escort the Imperial Yacht from St. Petersburg to Cherbourg.

After performing this honorary service, the VARIAG sailed to take her place in the Russian Asiatic Fleet.

The RETVIZAN was completed and had her official trial in October, 1901.

The most noteworthy feature of the history of these two ships is the extraordinary and hitherto unheard-of-performance exacted. They were required to steam at full speed for twelve consecutive hours, or two periods of six hours each, with only a slight interval between, and to maintain during that long period 18 knots per hour in the case of the RETVIZAN, and 23 knots in the case of the VARIAG under natural draught.

In both cases the requirements were met, the RETVIZAN making a trifle over her contract requirement of 18 knots and the VARIAG exceeding her contract speed of 23 knots by one-fourth of a knot, as a mean speed sustained for the twelve hours. This performance was attained with a mean collective indicated horse-power of 17,059. The VARIAG'S machinery was designed and calculated to develop 20,000 I.H.P., and is capable of doing it if required. But upon trial it was found that the contract speed could easily be attained without using the maximum of power, and as no particular benefit could be derived from any considerable excess over the requirements, the VARIAG'S engines were at no time during the trial driven up to more than seventeen-twentieths of their capacity.

THE TWIN-SCREW PROTECTED CRUISER VARIAG

General Dimensions.

Length on load-line.............. ..	420 feet.
Length between perpendiculars.....	400 "
Beam..........................	52 "
Draught.........................	19 " 6 inches.
Displacement at 19 feet 6 inches....	6,500 tons.
Speed per hour.....................	23¼ knots.

This vessel is designed to fulfil the highest requirements of a high-speed protected cruiser, carrying a large battery of quick-firing guns, and provided with an unusually large number of above-water torpedo-tubes.

The battery of the ship is as follows: Twelve 6-inch, 45 calibre, rapid-firing guns; twelve 50-calibre, 75 mm., rapid-firing guns; and six 3-pounder Hotchkiss guns.

The torpedo battery consists of: One bow tube; one stern tube; and four broadside training tubes.

The motive power, together with the magazines and munitions of war, which are commonly called the "vitals" of the ship, are placed beneath a protective deck extending from end to end of the vessel, rising at the central line of the vessel some twelve inches above the load-line, and sloping downward to four feet below the water-line at the sides.

This deck has a thickness on the flats of 1½ inches, and 3 inches on the slopes. For the whole length of the water-line coffer-dams extend from the protective deck to a considerable distance above the load-line, giving a cellular construction in the vicinity of the water-line for the entire length of the ship.

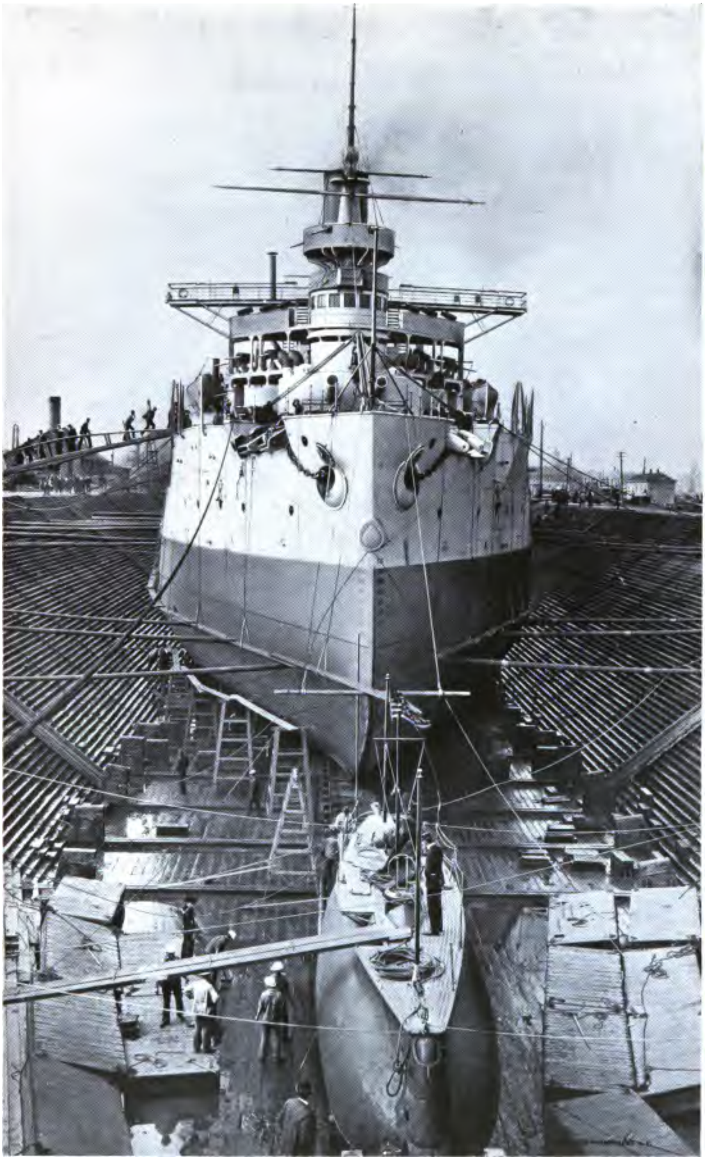
The boilers are of the well-known Niclausse type, and are thirty in number, arranged in four groups as follows: Three after-groups containing eight boilers each; the forward and last group consisting of six boilers.

These boilers have a grate surface of about 1,575 square feet, and a heating surface of about 62,000 square feet.

Almost the entire auxiliary machinery throughout the vessel is driven by electricity. Both steam and electrical steering-gear are provided.

The requirements for speed of this vessel were quite unprecedented, requiring a sustained speed of 23 knots for a period of twelve hours with open stoke-holes. These

Imperial Russian Cruiser **VARIAG.**



requirements were met in the fullest and most satisfactory manner, the maximum speed obtained being 24.3 knots per hour, the mean indicated horse-power for twelve hours being 17,059.

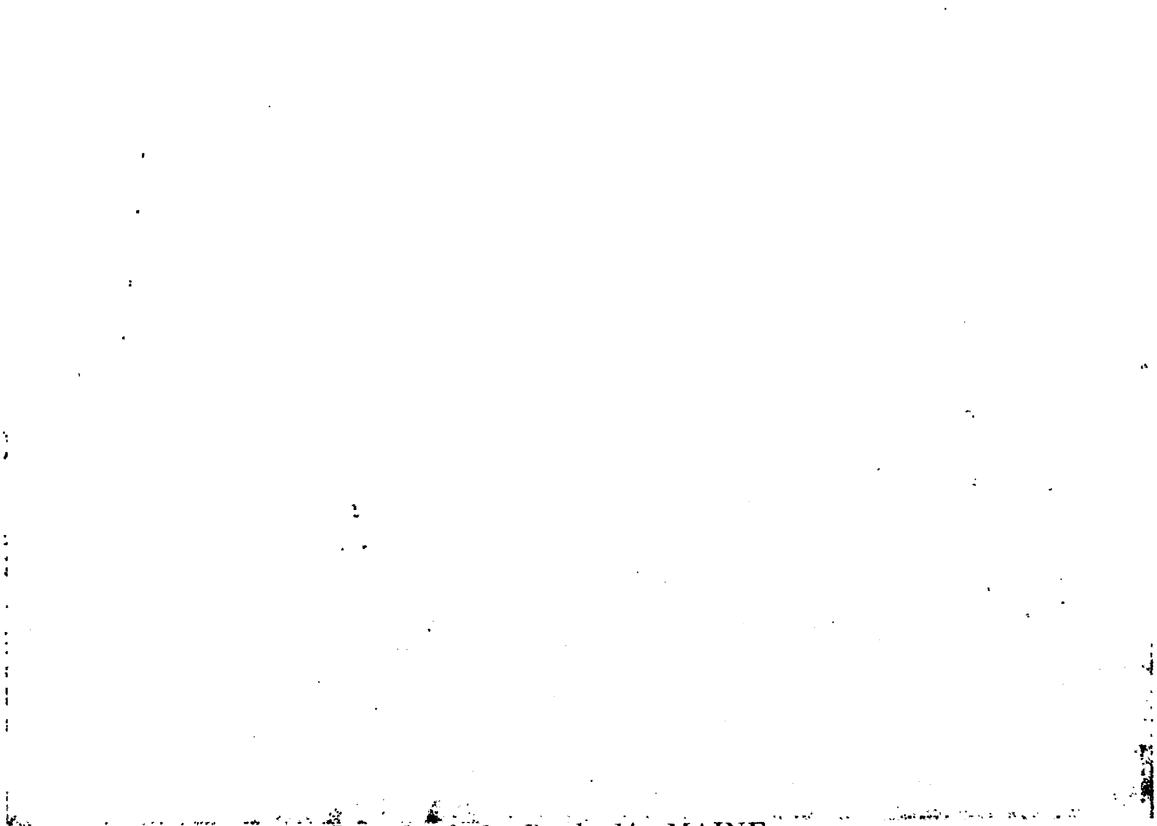
The amount of coal carried on the trial displacement was 770 tons, but a bunker capacity is provided to allow a radius of action of 5,000 knots at a speed of 10 knots per hour.

Accommodations have been provided for 21 officers, 9 petty officers, and 550 crew. It is a matter of interest that this ship has been fitted throughout with metallic furniture, the only furniture of wood being the chairs and the tops of the tables.

The vessel is provided with a very full equipment of small boats, two of which are forty-feet steam cutters, fitted with torpedo launching tubes. The boats are as follows: Two 40-feet steam cutters; two 12-oar cutters; one 16-oar barge; one 14-oar cutter; two 6-oar whale-boats; two 6-oar yawls.

The vessel is fitted with two military masts carrying 3-pounder rapid-firing guns. It is lighted throughout with electric lights, and is provided with all the modern and most approved conveniences for the comfort and the health of the officers and the crew.

UNITED STATES TWIN-SCREW BATTLE-SHIP MAINE



Launch of the Battle-ship MAINE.

UNITED STATES TWIN-SCREW BATTLE-SHIP MAINE

IN the fall of 1898, soon after Mr. Cramp's return from Russia, three battle-ships provided for in the appropriation of the previous spring were advertised for proposals.

The original scheme put forth called for vessels substantially of the ALABAMA type, but of about 1,000 tons greater displacement, and to have a speed of 17 knots an hour.

Mr. Cramp, however, offered a design closely similar to that which he had prepared for the RETVIZAN; and he proposed to build an 18-knot battle-ship within the limit of the appropriation made for one of 17 knots, and to effect this increase of speed by the use of water-tube boilers in lieu of the cylindrical boilers hitherto employed in that class of construction.

This offer was accepted, and all three of the ships were brought up to the 18-knot requirement.

Considerable delay occurred in the construction of the MAINE due to the attempt on the part of Congress to arbitrarily reduce the price of armor to a point which prohibited its manufacture. This restriction operated for a year and a half, but after it was removed progress upon the MAINE was rapid.

The following is a general description of the characteristics and qualities of the MAINE:

General Dimensions.

Length on load water line	388 ft.
Beam, extreme	72 ft. 2½ in.
Draught, on even keel	23 ft. 10¼ in.
Displacement at that draught	12,500 tons.
Indicated horse-power	16,000.
Speed per hour, for four hours	18 knots.
Coal carried on trial displacement	1,000 tons.
Coal capacity	2,000 tons.

Armament: Four 12-inch breech-loading rifles; sixteen 6-inch R. F.; six 3-inch R. F.; eight 6-pdr. R. F.; six 1-pdr. R. F.; two Colts; two 3-inch R. F. field-guns; two submerged Whitehead torpedo tubes.

Armor: Water-line belt extending the length of the machinery spaces, 7 feet 6 inches in depth, with a thickness of 11 inches, tapering to a thickness of 4 inches at the bow.

The main belt extends aft to abreast the after barbette. Above the main belt the vessel is provided with casemate armor 6 inches in thickness extending to the upper deck. This belt protects both the stability of the vessel and the battery of 6-inch rapid-firing guns.

The 12-inch guns are mounted in barbette turrets placed in the central line of the vessel, one forward and one aft, each turret containing two guns, the armor on the turrets being 12 inches in thickness with a face plate, and 11 inches for the balance of the armor. The barbettes are 12 inches in thickness, except at the rear, where the armor is reduced to 8 inches. The protective deck is worked in the well-known trapezoidal form, being flat in the central portion and sloping down below the water to the armor shelf at the sides. The plating on the flat is 2¾ inches thick and on the slopes from 3 to 4 inches thick.

Above the slopes of the protective deck, coffer-dams are worked, filled with cellulose, for further protection of the stability of the vessel.

The vessel is provided with quarters for 40 officers and 511 men, and is provided throughout with quarters embodying the most modern and improved accommodations for the officers and men.

The wood work has been reduced to a minimum; whatever wood is necessary to be provided in the quarters has been fire-proofed.

The engines are of the well-known inverted triple expansion type, driving twin screws, and steam is generated from 24 Niclausse boilers.

The vessel is provided throughout with electric lights, incandescent system, and also fitted with powerful search lights, as is the custom on vessels of the United States Navy.

Two masts of military tops are fitted, each mast being provided with platforms for rapid-firing guns and for search-lights.

Full complement of boats, both steam and rowing, usually prescribed for vessels of this class in the United States Navy, are provided and are handled by means of boat-cranes operated by electric motors.

The armor throughout has been tested by the Krupp process, and every improvement of standard character has been incorporated into the general design and outfit of the vessel.

COLORADO AND PENNSYLVANIA

COLORADO AND PENNSYLVANIA

THE COLORADO was authorized by Act approved June 7, 1900, and the PENNSYLVANIA by Act approved May 3, 1899; but the contracts for the two vessels were signed the same day, January 10, 1901, the delay in the case of the PENNSYLVANIA having been due to the armor situation, which was not relieved by the Congress which authorized the building of that ship.

The COLORADO and PENNSYLVANIA are armored cruisers of the first class. They are 502 feet long, 69 feet 6 inches beam, and 24 feet 1 inch mean draught, their normal displacement being 13,680 tons.

They are powered with twin-screw, vertical, triple-expansion engines, steam being supplied by water-tube boilers of the Niclausse type. They are required to develop a mean speed of 22 knots an hour for four hours, and their engines are estimated to develop a collective indicated horse-power of 23,000.

Their normal coal-supply is 900 tons, but the maximum bunker capacity is 2,000 tons. Their steaming radius at the most economical speed is estimated to be about 12,000 miles.

The contract price for the hull and machinery of the COLORADO is $3,780,000; and for the PENNSYLVANIA $3,890,000, based upon the original plan of sheathing that ship with wood. This has since been abandoned, causing the PENNSYLVANIA to be exactly a sister-ship of the COLORADO in every respect.

The general qualities and characteristics of these vessels are as follows:

General Dimensions.

Length on load water-line	502 feet.
Beam, extreme	69 " 6 inches.
Draught	24 " 6 "
Trial displacement about	13,700 tons.
Coal on trial displacement	900 "
Coal-bunker capacity	2,000 "

Armament: Main Battery.—Four 8-inch breech-loading rifles 45-calibre in length; fourteen 6-inch R. F. 50-calibre in length.

Secondary Battery.—Eighteen 3-inch B. L. R.; twelve 3-pdr. R. F.; eight 1-pdr. R. F.; two 3-inch field guns; eight machine guns.

The four 8-inch guns in pairs are mounted in two electrically controlled elliptical balanced turrets, having inclined port-plates, one forward and one aft in the centre line of the vessel, having an arc of fire of 270 degrees.

The 6-inch guns are mounted so that four fire directly ahead and four directly astern, with eight on each broadside.

The secondary battery is mounted in a commanding position, having as large an arc of fire as possible.

The armor is as follows:

Water-line belt 7 feet 6 inches in width, extending the entire length of the vessel. This belt, for the space occupied by the boilers and engines, will be 6 inches in thickness. From these points to the extremities the armor will be tapered to 3½ inches in thickness.

Above the main belt the side is protected by armor 5 inches in thickness for a length of about 232 feet, extending vertically through the main deck. Transverse armor bulkheads 4 inches in thickness are worked at the ends of the 5-inch armor. The 6-inch guns will be protected throughout by armor 5 inches in thickness. The armor for the 8-inch turrets will be 6 inches thick, except the port-plates, which will be 6½ inches. The barbettes will have a uniform thickness of 6 inches, with 3-inch ammunition tubes extending to the protective deck. The conning tower will be 9 inches in thickness, with a tube of 5 inches; and the protective deck of nickel steel will extend throughout the vessel, with 1½ inches of thickness on the flat and 4 inches of thickness on the slopes.

A cellulose belt of about three inches in thickness will be worked along the sides above the protective deck the entire length of the vessel.

The quarters for the officers and men will be of the most modern and improved type. Special arrangements have been made for the ventilation of the vessel throughout, to insure the health and comfort of the officers and crew.

The vessels will be lighted throughout with electric lights, incandescent system, and search-lights of the character usually fitted on vessels of this class in the United States Navy will be installed.

The engines will be of the inverted, vertical, triple-expansion type, with a combined indicated horse-power of 23,000, from which it is expected to obtain a speed of 22 knots per hour.

The boilers are of the Niclausse type, placed in six water-tight compartments. All the necessary auxiliaries and accessories will be provided for the complete working of the boilers.

Two masts of military tops are to be fitted, supplied with the standard type of military mountings and platforms for search-lights.

The boats will be ample in number to insure the safety of the crew of the ships, and will be handled by means of cranes operated by electricity.

The armor above five inches will be treated by the Krupp process, and all modern improvements of a standard character are to be incorporated in the outfit of the vessels.

THE OTTOMAN CRUISER

THE OTTOMAN CRUISER

EARLY in 1900, Ahmed Pasha, Chief Constructor of the Turkish Navy, came to this country for the purpose of examining our system of naval construction.

After a thorough survey, both of shipyard facilities and methods, and of their results in vessels built, he proposed, on behalf of the Sultan, to contract with the Cramp Company for the construction of a Protected Cruiser.

Plans and specifications were prepared and submitted to the Turkish Admiral, which, after thorough examination and a few minor changes to meet special requirements, were approved, and a contract for the construction of such a vessel was signed December 25, 1900.

This contract and the accompanying specifications call for a vessel of the following general characteristics and qualities:

Principal Dimensions.

Length on load line	330 feet.
Beam, extreme	42 "
Draught, mean	16 "
Displacement, about	3,300 tons.
Speed	22 knots.
Indicated horse-power	12,000.

Armament: two 6-inch R. F. guns; eight 4.7 R. F. guns; six 3-pdr. R. F. guns; six 1-pdr. R. F. guns.

This vessel is of the protected-cruiser type, the engines, boilers, and magazines being placed under an armored deck rising above the load-line at the central portion and sloping at the sides to 4 feet below the load-line. The maximum thickness of armor on the slopes is 4 inches.

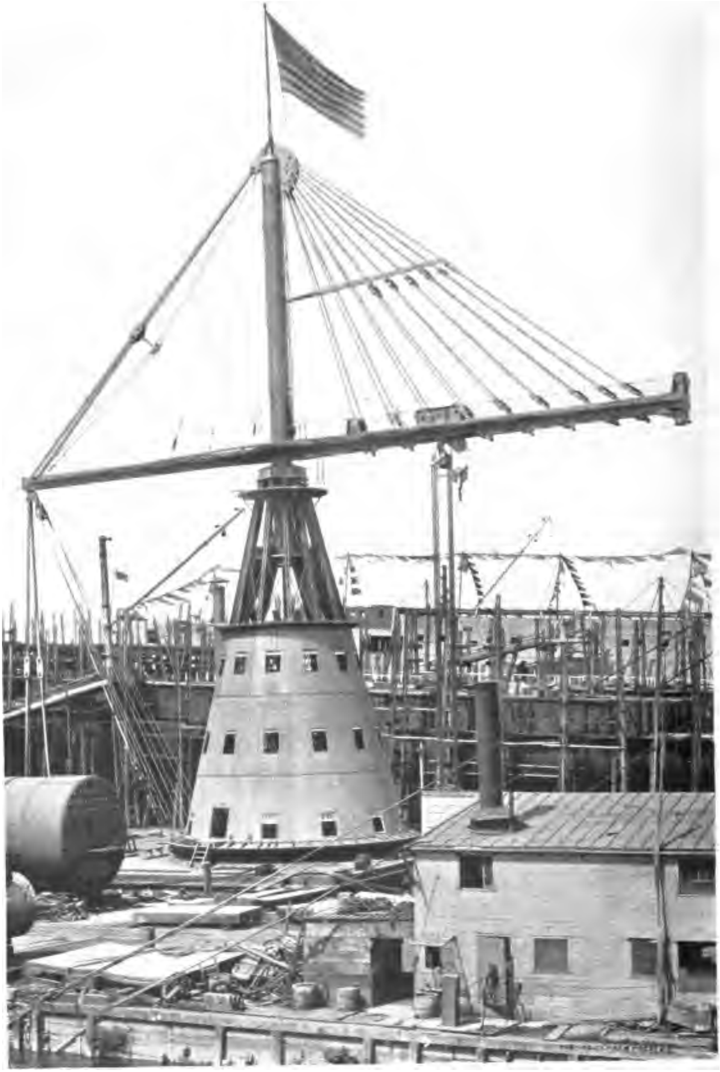
The ship is otherwise unarmored, except that the conning position is armed with 6-inch plates.

As will be noted, the battery is entirely of rapid-firing guns, and, for the displacement of the vessel, is very powerful.

The ship throughout will be provided with the modern conveniences for the health and comfort of the officers and men, and will be in every respect an up-to-date cruiser.

The engines are of the inverted triple expansion type, steam being supplied by Niclausse boilers.

THE ATLAS FLOATING DERRICK



Floating Derrick ATLAS.

THE ATLAS FLOATING DERRICK

THE most important single factor in the enlargement of the shipyard plant is the great 125-ton Floating Derrick, built in 1892. The dimensions of the ponton are 73 feet 4 inches long by 62 feet 2 inches wide by 13 feet 4½ inches deep. With maximum load (125 tons) at the boom end and with water-ballast aft sufficient to bring her to an even keel, she has 16 inches of freeboard, and her displacement is 1,563 tons. Her extreme height from deck to masthead is 116 feet 7½ inches. The height from deck to underside of boom is 65 feet. The height of net hoist, that is to say from deck to underside of hook with 30 inches of block clearance, is 50 feet 4 inches. Diameter of cone at base, 40 feet. Length of boom from axis of cone to centre of main hook when at boom end, 58 feet 6 inches. Swing of boom clear of ponton, 36 feet. Draught of water when ballasted to even keel with maximum load at boom end, 12 feet.

The best performance of the ATLAS up to this writing, has been that of taking an 80-ton boiler for the MINNEAPOLIS from the boiler-wharf, transporting it 100 feet and depositing it in the hold of the ship in twenty-seven minutes from the time of hooking on to the slings. On another occasion all four of the INDIANA'S main boilers, weighing 72 tons each, were taken from the wharf and put in place on board during one afternoon, in four hours and twenty minutes. The Company offered to transship the 124-ton gun of Krupp's Exhibit at the World's Fair with the ATLAS, but the German manufacturer had already concluded an arrangement to use the large shears of the Maryland Steel Company, at Sparrow Point.

The immediate necessity which led to the construction of the ATLAS, was the great breadth of the armored cruisers and the battle-ships, the shears in prior use not having sufficient out-hang to reach their centres. The extreme swing of the boom—36 feet—will be required to ship the boilers of the new battle-ship IOWA, which has a beam of 72 feet. The ponton of the ATLAS is of iron. The boom, mast, braces, collar, helmet, and all lifting and traversing gear are of steel. For weights up to fifty tons the boom swings independent of the ponton. For weights above fifty tons, the boom is stiffened by two steel backstays, and turns with the ponton.

The ATLAS is the largest and most powerful floating derrick in the world, the capacity of the next largest being 100 tons, with four feet less swing of boom and five feet less of net hoist. The advantages of such a tool in the processes of modern engineering and ordnance work are obvious when compared with stationary derricks and shears. In the latter case the ship must always be brought under the shears, and the objects to be hoisted on board must be brought to the wharf-end. But the ATLAS goes where the weight lies on the wharf, picks it up and then carries it to the ship wherever she may be. On one occasion the ATLAS went down to Girard Point, nine miles from the shipyard, picked up a large boiler, brought it to the works and deposited it on Cramp's wharf. She has sufficient seaworthiness and stability to navigate any part of Delaware River or Bay under tow, and in good weather could doubtless be towed safely to New York or the Chesapeake.

During the two years of her existence she has shipped on board various vessels under construction at Cramp's: 30

main boilers weighing from 70 to 84 tons, all the machinery parts of the largest five vessels ever built in America, all the armor, conning-tower, etc., for the NEW YORK, the commerce-destroyers and the battle-ships, performing her work with celerity and economy hitherto unknown to ship and engine-building. When it becomes necessary to remove piling placed in the river for temporary uses, the ATLAS pulls them up without difficulty. No single appliance in use at Cramp's Shipyard fulfils so many uses, saves so much labor, or gives so gratifying a return for the capital invested in her first cost or the money expended in operating her as does the great floating derrick ATLAS. Add to this the fact that, properly handled and cared for, she is practically indestructible and her value as an adjunct to the plant becomes apparent.

IN conclusion it seems proper to survey briefly the history of Ship-building in Philadelphia, and to that end we reproduce a monograph prepared for the "Book of Philadelphia," in 1893, by the late Henry W. Cramp.

Ship-building has been a prime industry of Philadelphia since the foundation of the city. During the colonial period no adequate records were kept, but from tradition and from private documents it is known that Penn himself began to promote ship-building within a few years after his settlement here. Of course, the earlier construction was not important, though it is known that vessels large enough for the coasting and West India trades were built within the present water-front of the city during the first quarter of the eighteenth century. Tradition places the locality of the first shipyard in the vicinity of the present foot of South Street. However, as a topic of general modern interest, ship-building in Philadelphia may be dated at the close of the War of Independence. That war had left the colonies entirely destitute of shipping.

It is worth while to remark, as a tribute to the sturdy patriotism of the First Congress, that with every temptation to buy ships abroad, with domestic ship-building paralyzed and with commerce languishing for want of vessels, the third act approved by President Washington prohibited the registry of foreign-built vessels ; and this act, as amended and enlarged December 31, 1792, now forms the basis of the navigation laws of the United States. During the period between the practical end of the Revolutionary War and the assembling of the first Federal Congress, that is to say, from 1781 to 1790, the Defence Acts of the Continental Congress remained in effect, and these permitted registry of foreign-built ships only when condemned as prizes of war. The records for that period are imperfect, but they show the construction of at least 162 vessels in Philadelphia shipyards, aggregating 18,000 tons register, or an average of about 110 tons. Excepting the ALLIANCE, a frigate presented to the King of France in 1784, which was of 732 tons, no ship larger than 300 tons was built at Philadelphia prior to 1790.

From 1790 till the outbreak of the war of 1812, Philadelphia easily led the country in ship-building, particularly in regard to the size and quality of the ships built. During those times even the whalemen of New Bedford and Nantucket, with New England shipyards alongside their own wharves, often came to Philadelphia to get their ships built. The ship-building supremacy of Philadelphia at this time was due partly to the excellent quality and great quantity of timber in the region tributary to her, and partly to the skill and aptitude which her shipwrights had inherited from the colonial times.

It was during this period also that Philadelphia inaugurated the era of steam navigation, by building for John Fitch the first American steamboat, which, in 1790, began regular trips between this city and Trenton, taking a day for it each way. A chronicler of that time says that "the boat is a pleasanter vehicle than the mail coach, because of its freedom from jolt and jar, but it is not so expeditious." A second steamboat was launched in 1791, about at the present foot of Palmer Street, but when nearly completed was driven from its moorings by a storm and wrecked on Petty's Island. This bankrupted Fitch and his backers, and steam navigation on the Delaware languished for several years. However, the name of Fitch's boat, the "Perseverance," lived after her and has become the motto of Philadelphia ship-builders.

In 1809 another steamboat line was established to run between Philadelphia and Trenton. This was successful, and steam navigation on the Delaware has since been uninterrupted. This incident is mentioned here in its chronological order as part of the ship-building history of the city, but, of course, it was many years before steam shipping began to cut any important figure in the sum total of output.

The first decade of the present century emphasized the supremacy of Philadelphia in naval architecture. Baltimore, Boston, and New York, in the order named, struggled along during this period, but far in the rear; so much so that Philadelphia constantly built East Indiamen for Boston merchants, Atlantic packets for the New Yorkers, and coasters and coffee ships for the Baltimore trade, taking the cream of ship-building orders away from the shipyards of those ports by simple dint of superior skill and economy. One Philadelphia ship, the REBECCA SIMS, of 500 tons, built at Kensington in 1801, made about 100

Atlantic passages between that date and 1823, and then, being sold to a New Bedford firm for whaling service, made eleven round-the-world sperm and right-whaling voyages, until 1862, when she was bought by the United States and used as a coaling ship for the blockading squadron off Charleston in 1862. After some service in this capacity the good old ship was scuttled and sunk in Morris Island Channel to close it against blockade runners. The quality of the REBECCA SIMS as a sample of Philadelphia ship-building may be inferred from the fact that, in May, 1807, she left the Capes of the Delaware, and in fourteen days hauled up to her wharf, at Liverpool, "without once shivering her topsails," as sailors say. That was eighty-six years ago, but the old REBECCA SIMS still holds the sailing record between Cape Henlopen and the Mersey, and probably will hold it forever.

In a paper of more extensive scope than this one it would be a pleasant task to recall in some detail the glories of Philadelphia ship-building during this period, but the conditions of space forbid it here.

After the war of 1812, ensued a long period of depression in all trades and industries, which the shipyards of Philadelphia shared, though the enterprise of her builders found some relief in the construction of a very considerable tonnage for foreign account.

This embraced both merchant ships and men-of-war, and included one line-of-battle ship, which was sold, in 1826, to the Emperor Nicholas, of Russia. At this time the depletion of forests in Great Britain began to tell on ship-building in that country, and in 1830 two Philadelphia ships, originally built for the China trade, of 1,800 and 1,540 tons respectively, were purchased by the English East India Company. This raised a great fuss in England, and resulted in action by the Board of Trade which effectually closed the British market to American-built ships, the British authorities resolutely insisting that their merchants must have their ships built in England, even though they had to import almost every foot of timber used in their construction.

What may fairly be termed the modern epoch of Philadelphia ship-building began about 1830. Her supremacy in all the arts pertaining to naval architecture had by that time become so well established, and so universally admitted, even by cities which had hitherto pretended to some sort of rivalry, that the question of the future was simply that of holding her own.

When the great transition came from wood to iron and from canvas to steam, the old shipyards succumbed one by one until, about 1870, William Cramp and his sons found that the task of perpetuating the ship-building supremacy of Philadelphia, in the new era, practically devolved upon them. How they performed this task, and how deep and broad they laid the foundations of the shipyard that bears their name, such ships as the NEW YORK, COLUMBIA, and INDIANA and the new Atlantic Liners may testify. In the sixty-three years of its existence this shipyard has given to commerce and to the public service 269 ships, and now has 13 more in various stages of construction ; and in the twenty-three years that have elapsed since the incorporating of a marine engine plant with the shipyard 141 engines of every description and capacity, up to about 10,000 indicated horse-power, have been its output.

The tendency to augment the size and power of steamships has now doubtless approached the maximum of commercial practicability, but it has already reached a stage at which the small shipyard, except for special construction, such as tugs, yachts, and river craft, is necessarily a thing of the past, and the fourteen busy yards which were the pride of Philadelphia sixty years ago will never be seen again.

It may be remarked that some persons entertain the belief that the predominance of Philadelphia in ship-building is of recent date and due largely to the radical changes in material and conditions of construction. The reverse is true. There has never been a day from 1710 to 1898 when Philadelphia was not in the lead in everything pertaining to naval architecture, and since the advent of the steam era, in marine engineering. In the old days Baltimore sometimes rose to the dignity of what sporting people call a "pretty good second," and New York has undergone occasional brief spasms of ship-building activity, but the career of Philadelphia has been steady, her progress consecutive, and the rank she enjoys to-day of the first ship-building city of the Western Hemisphere and second to none in the world so far as importance and quality of output are concerned, is simply that which she has honestly earned in nearly two centuries of steadfast diligence and patient skill.

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